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DISSERTATION ABSTRACTS

ABSTRACTS OF DISSERTATIONS AND MONOGRAPHS IN MICROFORM

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UNIVERSITY MICROFILMS, INC.
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AGRICULTURE, GENERAL

THE EFFECT OF EPTC ON BARNYARD GRASS

(Order No. 61-3920)

Jean Howard Dawson, Ph.D.
Oregon State University, 1961

Major Professor: William R. Furtick

The effect of ethyl N,N-di-n-propylthiolcarbamate (EPTC) on barnyard grass (Echinochloa crusgalli (L.) Beauv.) was studied in order to determine the parts or functions of the plant injured by EPTC and the part of the seedling where uptake of lethal amounts of EPTC occurs.

Seed germination was not affected by EPTC nor was there any visible injury to roots of plants exposed to EPTC. The symptoms of EPTC injury were consistent and involved leaf tissue. The foliar leaves contained within the coleoptile turned very dark green, appeared water-soaked and did not develop normally beyond the coleoptile after seedling emergence.

The first internode of EPTC-injured seedlings frequently became kinked. This kinking appeared to be related to resistance to seedling elongation. It increased as soil compaction increased and was absent in seedlings which elongated in paper towels or very loose soil. Furthermore, the kinking was duplicated without EPTC exposure in seedlings which grew from seeds in tightly compacted soil. Other evidence suggested the first internode of EPTC-injured seedlings functioned normally. It was concluded that leaf tissue is the prime site of EPTC injury in barnyard grass and kinking of the first internode is a secondary effect of this injury.

Microscopic examination of stained slides supported this conclusion. First internodes of injured and normal seedlings were similar in appearance. Physical and chemical changes induced by EPTC were evident in the mesophyll of the young foliar leaves.

A method was developed whereby selected portions of the emerging barnyard grass seedling could be exposed to EPTC while the rest of the plant was protected. Exposing the primary roots to EPTC did not result in injury. Exposing the coleoptile and first internode or just the coleoptile resulted in lethal injury. It was concluded that the coleoptile is an important and probably the main site of EPTC uptake which results in death of barnyard grass seedlings.

A study of barnyard grass seedling development showed that the first internode was responsible for most of the seedling elongation. The coleoptiles ranged from 4 - 8 mm in length regardless of seeding depth. This suggested that shallow incorporation of EPTC would provide the most efficient coleoptile exposure.

Excellent barnyard grass control from EPTC at 1 and 3 lb/A incorporated 1 inch deep was obtained, but it was of shorter duration than that from the same rates incorporated 3 or 5 inches deep. Apparently, the volatility of EPTC led to rapid loss from the shallow incorporation.

Further research is needed to determine the application method which will maintain a lethal concentration of EPTC in the surface soil for the longest time from a given application rate.

Microfilm $2.75; Xerox $5.60. 112 pages.

RECONSTITUTION OF DRY MILK PRODUCTS

(Order No. 61-3680)

Charles Herbert Pyne, Ph.D.
University of Minnesota, 1961

Adviser: S. T. Coulter

A basic physical concept of the process of reconstitution of dry milk products was developed integrating capillary movement of the reconstituting liquid in the powder interspaces and the wettability of the powder surfaces. An approach was made to a method of manufacturing an easily reconstituted dry whole milk by aeration of the condensed milk prior to drying.

The hydraulic radius was established as an equivalent radius value for anticipating capillary movement of liquids in the milk powder interspaces. A permeametric technique was employed as a means of determining the hydraulic radius of milk powders. The hydraulic radius was proportional to the particle size. Values for specific surface and porosity determined by permeametry also proved useful in developing a factor to account for the viscosity change in the reconstituting liquid.

Particle density was a necessary value for the permeametric measurement. An air comparison pycnometer was developed which facilitates rapid and accurate determination of the particle density.

Wettability ($\cos\theta$) of the surfaces of the milk constituents, the powder particles and the powder masses was determined by the classic procedure of contact angle measurement. The wettabilities ($\cos\theta$'s) of the milk proteins and of the fat were less than one; the remaining milk constituents were completely wettable ($\cos\theta = 1$). The wettability ($\cos\theta$) of the particle surface was dependent upon the composition of the particle and the state of the fat. The wettability ($\cos\theta$) of the powder mass was dependent upon the wettability ($\cos\theta$) of the particle surface and particle size. Both wettable and non wettable non fat dry milks and dry whole milks powder surfaces were found.

Reconstitution characteristics were determined employing a low energy mixer and a modified Mojonnier procedure for solids determination. The mixer was designed to facilitate measurement of all phases of the reconstituting system of milk powder at six second intervals over the entire reconstitution period. Milk powders with a non

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wettable surface reconstituted at a slow constant rate with no measurable dispersed but incompletely dissolved particles. The wettable surfaced powders reconstituted at a high initial rate characteristic of the powder. Dispersed but incompletely reconstituted particles were noted on reconstitution of all wettable surfaced powders. The high initial rate of reconstitution was proportional to the square of the hydraulic radius. The hydraulic radius squared accounted for the rate of capillary movement anticipated by the hydraulic radius and the viscosity factor as substituted in the equation for capillary movement under the conditions of reconstitution.

Aeration of the condensed milk prior to drying yielded a thin walled powder particle which reconstituted at the surface of the reconstituting liquid. The reconstitution characteristic of the aerated product was superior to the conventional dry whole milk. The thin wall structure of the aerated product was a means of circumventing the factors which had been previously shown necessary for rapid reconstitution in conventional dry milk products.

Microfilm $2.75; Xerox $9.25. 202 pages.

THE INFLUENCE OF BULK DENSITY AND AGGREGATE SIZE ON SOIL MOISTURE RETENTION

(Order No. 61-3051)

Prabhakar Mahadeo Tamboli, Ph.D.
Iowa State University of Science and Technology, 1961

Supervisor: W. E. Larson

Through manipulation of soil by tillage implements the bulk density of the soil is changed, and the aggregate size and arrangement is altered. These changes influence the void-solid ratio and consequently affect soil moisture relationships and plant growth. This study was therefore concerned with the effect of aggregate size and bulk density on the soil moisture retention characteristics.

Six aggregate sizes of Nicollet silt loam (Agronomy Farm at Ames, Iowa) ranging from 0.5 to 9.5 mm. diameter were used to study the effect of aggregate size on soil moisture retention. In order to study the effect of bulk density and the inter-relationships of aggregate size and bulk density on soil moisture retention, levels of bulk densities of 0.95, 1.15 and 1.36 g. per cc. and aggregate sizes of 0.5, 1.0 and 3.0 mm. were selected. In all studies the range of soil moisture tension used was from 0.10 to 15.0 bars. The particle size distribution, organic carbon content, total surface area, and apparent bulk density of the aggregates were also determined.

On the basis of the results of this study, it is concluded that (1) between tensions of 0.10 and 1.0 bar, the gravimetric percent moisture retained by various sized aggregates was in the following order: $0.5 < 1.0 < 2.0 \cong 3.0 \cong 5.0 \cong 9.5$ mm.; (2) between tensions of 1.0 and 5 bars, the gravimetric percent moisture retained was in the following order: $0.5 < 1.0 \cong 2.0 \cong 3.0 \cong 5.0 \cong 9.5$ mm.; (3) at tensions of 10 and 15 bars, the moisture retained by aggregates of various sizes was essentially the same; (4) the gravimetric percent moisture retained at tensions up to 5.0 bars, at three levels of bulk densities was in the following order: $0.95 < 1.15 \leq 1.36$ g. per cc.; (5) the volumetric percent moisture retained at tensions up to 5.0 bars as influenced by three levels of bulk densities was in the following order: $0.95 < 1.15 < 1.36$ g. per cc.; (6) the interaction between aggregate size and bulk density was also found significant at most tensions; and (7) the effect of soil moisture tension on moisture retention by various sized aggregates and at various levels of bulk densities was more pronounced in the range of 0.10 to 1.0 bar than in the range of 2.0 to 15.0 bars.

In the smaller aggregate size range, water retention was directly related to the aggregate size and inversely related to the apparent bulk density of the aggregates. It is therefore suggested that the differences in moisture retention by aggregates of various sizes are due to variation in the intra-aggregate porosity.

The differences in moisture retention at various levels of bulk density are considered to be due to two factors. Firstly, the weight of aggregates in a given volume of soil is more at a higher level of bulk density than at a lower level. Thus greater intra-aggregate pore space is available for retention of moisture. Secondly, changes in bulk density affect moisture retention due to the differences in interaggregate pore space distribution. The results of this study have shown that the variation in aggregate size and bulk density have an appreciable effect on soil moisture retention. Thus, appreciable errors in estimation of moisture retention in the field are possible when ground instead of undistributed soil samples are used.

Microfilm $2.75; Xerox $5.60. 113 pages.

AGRICULTURE, ANIMAL CULTURE

SOME PHYSICAL AND CHEMICAL CHANGES OCCURRING IN OILED AND UNOILED EGGS DURING SHORT STORAGE PERIODS

(Order No. 61-3664)

Glenn Wesley Froning, Ph.D.
University of Minnesota, 1961

Adviser: Milo H. Swanson

A group of experiments was conducted to study some of the chemical and physical changes in oiled and unoiled eggs.

The syneresis phenomenon was shown to occur in oiled eggs. Ovomucin increased in concentration in the thick albumen of oiled eggs. However, ovomucin content of the outer thin albumen of oiled eggs decreased in concentration. No change in over-all relative ovomucin concentration was indicated in either oiled or unoiled eggs during storage. Nonmobile protein, as determined by paper electrophoresis, paralleled ovomucin changes.

Per cent solids of the albumen of unoiled eggs increased somewhat during storage, whereas oiled eggs showed little increase in per cent solids of the albumen. Per cent yolk solids of unoiled eggs decreased markedly during storage while per cent yolk solids of oiled eggs declined at a somewhat slower rate. The per cent solids in the various albumen layers of unoiled eggs became practically equal with storage. Oiled eggs maintained close to the

same relative solids composition, as found in fresh eggs, except that per cent solids in the inner thin albumen layer was lower in concentration after storage. Thus, some evidence was shown that dilution of the inner thin albumen of oiled eggs may have come from extruded liquids from the thick albumen.

Per cent protein changes followed almost the same patterns as per cent solids fluctuations. Composition of the total protein complex in the albumen layers of oiled eggs, as determined by paper electrophoresis, was maintained close to the same relationship as noted in the initial control eggs. However, in unoiled eggs the albumen layers became practically identical in protein composition after storage. Furthermore, unoiled eggs exhibited a decline in per cent ovalbumin and an increase in per cent of the protein fractions of conalbumin plus ovoglobulin plus ovomucoid during storage.

Different recommendations for time of oil application were necessary depending on temperature of storage and method of oil application. These recommendations were based on how best to maintain egg quality and still have an egg with an acceptable cloudiness score and with a minimum amount of outer thin white. Thus, the following recommendations were applicable: (a) Eggs which were oil-sprayed and held at 55°F. could be oiled immediately after gathering; (b) A delay in oil dipping of 8 to 12 hours after gathering was necessary when eggs were held at 55°F.; (c) Regardless of the oiling method used, eggs stored at 32°F. could be oiled immediately after gathering (cloudy whites and increased outer thin albumen were as much of a problem in unoiled eggs as in oiled eggs stored at 32°F.).

Oiling was more effective than refrigeration alone for egg quality preservation. Egg quality was best maintained when oiling was supplemented by refrigeration. Nevertheless, oiling may act as a partial substitute for refrigeration, particularly in countries where refrigeration facilities are limited.

Albumen from oiled eggs following storage produced angel cakes of significantly higher volume than albumen from unoiled eggs held under the same conditions. Stored separated albumen produced angel cakes of comparable volume to that obtained from the albumen of oiled eggs. Increased lipid material was indicated to be a factor in decreased volume of angel cakes made from the albumen of unoiled eggs. Also, protein degradation, especially ovalbumin, may have been instrumental in the decreased volume of angel cakes made from the whites of unoiled eggs.

Microfilm $2.75; Xerox $6.20. 130 pages.

EFFECTS OF BARLEY HULLS ON ENERGY UTILIZATION BY SWINE

(Order No. 61-3929)

Leland Murray Larsen, Ph.D.
Oregon State University, 1961

Major Professor: J. E. Oldfield

A series of three experiments utilizing 148 pigs through the growth period from weaning to about 200 pounds was conducted to investigate the nutritional role of the fibrous barley hull, and to examine the means by which pelleting physically or chemically improves barley rations.

Pigs consuming barley or corn rations containing barley hulls exhibited a decreased rate of gain ($P<0.05$) and efficiency of feed conversion ($P<0.01$) when compared to those on control pearled barley and corn rations without hulls. Depression noted upon addition of an equivalent amount of fiber from purified wood cellulose was not as extreme as that observed with barley hulls. Fiber from barley hulls also resulted in a decreased backfat thickness ($P<0.05$), while cellulose failed to markedly lower deposition of backfat. Digestibility of dry matter, crude fiber and nitrogen-free-extract was lower ($P<0.01$) in rations containing double the normal quantity of barley hulls than in a control pearled barley ration, but addition of an equivalent amount of fiber from cellulose lowered only digestibility of dry matter and crude fiber ($P<0.05$), and to a lesser degree. Further, addition of barley hulls and cellulose lowered the digestible energy of the ration to 89 and 95 per cent, respectively, of that of the control pearled barley ration. It is concluded that the barley hull does more than merely dilute available nutrients of the diet with an indigestible material (cellulose). Lignification of hull fiber and other as yet unidentified factors appear to be responsible for this additional depression.

Pelleting of barley rations effected an improvement in growth and feed conversion efficiency of pigs, but pelleting was ineffective in improving corn rations. Physical alteration of the feed seemed to account for most, if not all, of the beneficial changes induced by pelleting. Evidence supporting this conclusion was derived from observed reversion of the feeding value of pellets to that of a meal after regrinding, and from failure of poorly-formed pellets to improve animal performance. In addition, subjecting the barley grain to moist heat at 220°F did not increase the growth rate of meal-fed pigs, nor did this prior treatment of the barley have an effect on the pelleting response, indicating that the heat and steam of pelleting induces no beneficial chemical changes. Enhanced palatability, as evidenced by reduction of feed wastage, offers the most plausible explanation for the improvement noted upon pelleting. Certain chemical changes in the crude fiber fraction were observed to result from pelleting, but these were of slight magnitude and of doubtful nutritional significance.

Supplementation of barley rations for swine with five per cent prime beef tallow increased growth rate and feed conversion of meal-fed pigs ($P<0.01$), but fat addition did not further enhance performance of pigs fed pelleted barley rations. Crumbling of fat-containing pellets may have prevented manifestation of such an additive effect between pelleting and fat supplementation.

Supplemental enzyme preparations failed to improve gains or feed conversion efficiencies of either meal- or pellet-fed pigs to a significant degree.

The barley hull, it is concluded, imposes an energy limitation on swine which can be partially overcome through physical alteration of the feed by pelleting, or through increasing the concentration of available energy in the ration by fat supplementation.

Microfilm $2.75; Xerox $4.60. 87 pages.

PARTIAL PURIFICATION AND CHARACTERIZATION OF B-ESTERASE OF BOVINE MILK

(Order No. 61-3242)

Morris W. Montgomery, Ph.D.
Washington State University, 1961

Chairman: T. L. Forster

Since B-esterase appears to be a component of the milk lipase system, purification and characterization of the enzyme would contribute to the knowledge of the lipase system of bovine milk. B-esterase activity was determined by Warburg manometric techniques using tri-n-butyrin as substrate with a bicarbonate buffer at pH 8.0. Activity was expressed as A_{30} units, i.e., the net μl of CO_2 evolved by 1 ml of milk or enzyme preparation during a 30 minute incubation period at 37°C. Nitrogen was determined by a semi-micro Kjeldahl procedure and expressed as mg N/ml of milk or enzyme preparation. Purification was calculated on the basis of increase in specific activity, i.e., A_{30} /mg N.

The purification procedure was as follows: Individual cow milk having high B-esterase activity was selected. All subsequent operations, except the assays for enzyme activity and nitrogen, were conducted in the cold room (2-5°C). Two hundred ml of gravity separated skim milk were added to 25 ml of $Mg(OH)_2$ suspension in a 250 ml centrifuge bottle and shaken gently for 5 minutes. The mixture was then centrifuged (800 X g) for 10 minutes, the supernatant discarded, and the sides of the centrifuge bottle rinsed with distilled water while the bottle was inverted. Twenty-five ml distilled water were added to the bottle, the $Mg(OH)_2$ pellet was dispersed by shaking and again centrifuged (15 minutes at 800 X g). Again the supernatant was discarded. The $Mg(OH)_2$ was immediately transferred to a stainless steel pressure cylinder by rinsing the centrifuge bottle with three successive 30 ml portions of distilled water. After flushing with CO_2 a pressure of 30 psi of the gas was applied for 30 minutes during which time the cylinder was continuously shaken in a horizontal plane. At this point, if the $Mg(OH)_2$ was completely decomposed, the preparation foamed considerably when the pressure was released. A trace of foam depressant was added, the liquid transferred to dialysis bags and dialyzed against repeated changes of distilled water for 48 hours. An average of 24-fold purification with 46% recovery was obtained on three trials.

Ammonium sulfate fractionation, acetone fractionation, and column chromatography on DEAE cellulose were used unsuccessfully in attempts to further purify the above preparation of B-esterase. However, a second adsorption on $Mg(OH)_2$ did result in additional purification of the esterase. The above procedure was repeated, using 0.5 gm of $Mg(OH)_2$ suspension for each 25 ml of volume of once adsorbed preparation and an adsorption time of 120 minutes. The $Mg(OH)_2$ pellet was not washed, but was transferred directly to the pressure chamber with 50 ml of distilled water and decomposed. After dialysis three preparations resulted in over-all purifications of 65-fold with 14% recovery. A green precipitate formed on dialysis which had a purification of 148-fold with 9% recovery. It has not been possible to repeat this high degree of purification using larger quantities of preparation, however, purifications of approximately 50-fold have been repeatedly obtained using the larger quantities.

Three preparations of B-esterase, purified approximately 50-fold, did not require a cofactor, appeared to be inhibited by Triton X-100, were inhibited by DFP and Parathion at concentrations similar to those which inhibit B-esterase in milk, and was found to hydrolyze milk fat at approximately one-fifth the rate of tributyrin.

Microfilm $2.75; Xerox $3.80. 68 pages.

OBSERVATIONS CONCERNING THE CHOLINESTERASE FOUND IN BOVINE BLOOD PLASMA AND COLOSTRUM

(Order No. 61-3252)

John Ernest Montoure, Ph.D.
Washington State University, 1961

Chairman: T. L. Forster

Investigations for the presence of an eserine sensitive enzyme responsible for rancid flavor development in milk led to establishing the presence of pseudo-cholinesterase in colostrum of dairy cows. The enzyme activity decreased from a very high level immediately after parturition to a very low and doubtful level within three days post calving. This enzyme is completely inhibited by 10^{-5} M eserine sulfate and is capable of hydrolyzing non-choline esters at a rate equal to or greater than that for 0.055 M acetyl-choline chloride. A further study of its characteristics indicated a rather stable enzyme. Colostrum samples could be stored in the frozen state for more than a year without loss of enzyme activity. Also, laboratory refrigerator storage for sixty hours was not detrimental to the enzyme. The enzyme activity was determined manometrically using propionyl choline-p-toluene sulfonate as substrate.

The activity pattern with relation to milking number post calving is quite similar to that for immune protein production, however, upon investigation, this similarity appeared to be coincidence. The plasma enzyme activity level of the calf at birth was much greater (A_{30} = 153-243, A_{30} = μl CO_2 evolved/ml/30 minutes) than that for blood plasma of mature cows (A_{30} = 30-83), a finding in direct opposition to that for immune proteins. The ingestion of colostrum by the calf did not increase its blood plasma enzyme activity level. The activity level of calf blood plasma, though much higher at birth (A_{30} = 153-243), decreased in ten days to values (A_{30} = 64-77) within the range of values (A_{30} = 30-83) found for mature cows in normal lactation. A direct comparison between blood plasma of the cow and her calf indicated no apparent relationship between their respective enzyme activity levels.

A maximum purification of over 400-fold, based on specific activity (specific activity = μl CO_2 evolved/mg N/30 minutes, skimmed colostrum = 29, purified preparation = 12,200), was obtained for colostrum pseudo-cholinesterase. This was accomplished through a combination of ammonium sulfate precipitation and ion-exchange chromatography. Colostrum protein, obtained between 0.5 and 0.8 saturation with ammonium sulfate, was placed on a 15 gm DEAE-cellulose column (2 X 34 cm) and eluted

with phosphate buffer. A linear concentration gradient at constant pH was used as eluting buffer with a flow rate of less than 40 ml/hr. The optical density of each fraction was determined at 280 mμ and activity determined using 0.01 M propionyl choline-p-toluene sulfonate as substrate at pH 8.0. A graph of fraction number vs. optical density and activity indicated that the activity reached its maximum and started to decrease before the optical density reached its maximum.

Lyophilization of the eluate fractions containing enzyme activity did not destroy this activity. When the lyophilized preparation was examined electrophoretically on paper, only one major protein peak was evident. This peak contained the enzyme activity.

Microfilm $2.75; Xerox $4.00. 75 pages.

EFFECT OF SOME ENVIRONMENTAL STRESSES ON SWINE

(Order No. 61-3243)

James Curran Nofziger, Ph.D.
Washington State University, 1961

Chairman: M. E. Ensminger

Eighty Palouse gilts of breeding age were divided into two groups of 40 and each of these groups further divided into groups of 10. All gilts were bred to fertile boars. An average of 35 days after breeding one group of 10 gilts was assigned to each of the following treatments: (1) control, (2) transported 160 miles and left in a strange environment, (3) transported 160 miles and returned to their familiar surroundings and (4) walked a short distance to strange surroundings and left. An average of 90 days after breeding the other 4 groups of 10 gilts were assigned to the same 4 treatments.

Blood was taken from an ear vein of all gilts the day before and 5 days after treatment for use in the plasma adrenal steroids. The groups stressed early in gestation were killed 10 days after treatment. A third sample of blood was taken at this time and the reproductive tract removed and examined for evidence of embryonic mortality due to treatment. The groups stressed late in gestation were allowed to farrow and the effect of treatment based upon the number of mummified pigs delivered.

No effect due to treatment was evident at either stage of gestation, thus, failing to uphold the hypothesis that transportation or movement to strange surroundings or both have a detrimental effect upon the reproductive efficiency of bred gilts.

One hundred and fifty-six Palouse pigs were taken at weaning and allotted to one of the following treatments: (1) group of 8 pigs allotted 8 square feet each, (2) group of 8 pigs allotted 12 square feet each, (3) group of 8 pigs allotted 24 square feet each and (4) group of 28 pigs allotted 12 square feet each. The pigs were self-fed a finishing ration until the group reached an average weight of 200 to 210 pounds, at which time 6 or 8 market weight pigs from each group were slaughtered and carcass data taken. At the time of slaughter blood samples were taken for use in determining blood serum protein patterns.

Neither pen size nor number of pigs penned together had an effect on average daily gain from weaning to market weight or on feed efficiency during this time. There was no difference due to treatment in the serum protein patterns. The pigs in the groups of 8 allotted 8 square feet were leaner ($P < 0.20$) when specific gravity was used as the measure. When specific gravity, back fat thickness, per cent lean cuts and per cent belly were considered, the pigs in groups of 8 allotted 8 square feet tended to have more desirable carcasses than the other groups.

Microfilm $2.75; Xerox $3.00. 51 pages.

URINARY CALCULI IN SHEEP

(Order No. 61-3249)

Elvin David Taysom, Ph.D.
Washington State University, 1961

Chairman: Irwin A. Dyer

Crossbred (Suffolk X Rambouillet and Hampshire X Rambouillet) male lambs were used in these experiments. The basal ration consisted of wheat straw, 25 per cent; dried beet pulp, 25 per cent; linseed meal, 18 per cent; oats, 17 per cent; and wheat 15 per cent. Calcium carbonate, magnesium carbonate, di-potassium phosphate, sodium silicate, vitamin A, and vitamin D were added to the basal ration separately and in combination.

Calcium, phosphorus, magnesium, vitamin A and vitamin C of the blood was determined. Volume, total solids, calcium, phosphorus, magnesium and pH of the urine were determined periodically during the trials. Fecal samples were analysed for magnesium, calcium and phosphorus content.

When an animal developed symptoms of urinary calculi he was sacrificed before he died. All lambs that were alive at the end of the experiment were slaughtered and their complete urinary tracts were examined.

Phosphorus supplement was apparently the cause of the highest incidence of calculi the first year. Apparently high pH of the urine does not predispose to the formation of calculi. A vitamin A or carotene-free diet does not seem to be involved in calculi formation. The rams that produced urine with the lowest total solids were the rams that had the highest incidence of calculi. In the lots where there was a high incidence of calculi, the rams had an increased rate of water consumption and an increased rate of urine excretion.

The second year the blood levels of calcium, phosphorus, and magnesium in this experiment were not changed significantly by the addition of these elements in the ration. Neither were the levels increased in the urine.

A calcium-phosphorus ratio of 0.5 to 1.0 produced a significantly greater number of calculi than a ratio of 1.25 to 1.0 under the conditions of this experiment, especially in lots where magnesium was not added and silica was added to the feed. The addition of magnesium or the absence of silica in the ration or both, had an alleviating effect on the incidence of calculi. Large amounts of phosphorus in proportion to calcium predisposed to the production of urinary calculi in this experiment. In the third year experiment all lots received an additional phosphorus supplement, but no additional calcium or magnesium.

Thus, from previous experiments calculi were expected to be produced in all lots. However, in lots where the ration contained 10 per cent beet pulp and 40 per cent straw, the incidence of calculi was slight (three cases out of sixteen animals) compared to other lots.

Vitamin D was added to the ration of half of the lots to see if there was a deficiency of vitamin D which was affecting calcium and phosphorus metabolism. Also, if the supply of vitamin D was sufficient to meet the requirements of the animals, the effects of additional vitamin D were tested. This had no significant effect.

The most significant part of this experiment was the frequent occurrence of calculi in lots where beet pulp made up 25 per cent or more of the ration. In these eight lots of four sheep each or thirty-two in all, there were twenty-four animals or 75 per cent with calculi in their urinary tracts. Under the conditions of this experiment, beet pulp predisposed lambs to the formation of calculi.

Microfilm $2.75; Xerox $3.00. 57 pages.

AGRICULTURE, FORESTRY AND WILDLIFE

FACTORS DETERMINING PRODUCTION OF COHO SALMON, ONCORHYNCHUS KISUTCH, IN THREE OREGON STREAMS.

(Order No. 61-3917)

Donald Wallace Chapman, Ph.D.
Oregon State University, 1961

Major Professor: Charles E. Warren

A study of coho salmon production and ecology was conducted from July, 1958 to March, 1961 in three small Oregon coastal streams. Factors investigated included stream characteristics, coho production in terms of tissue elaborated by time period, coho behavior as a factor affecting coho population size, and energy transfer as a factor affecting coho growth. Production data was developed for the coho 1959 year class. Physical data obtained in the study of stream characteristics included stream-flow, rainfall, water temperature, suspended sediment loads, light incidence, water chemistry, and stream area measurements. Biological characteristics of the stream environments were discussed in qualitative terms.

Standing crop changes, yield, and growth rate of coho were studied as a means of securing production statistics. Production per fortnight showed two peaks; one soon after fry emergence and another shortly prior to smolt migration. Biomass showed the same peaks. Production per unit of pool area for about 14 months was nearly the same on all three streams, ranging from about 15 to 17 grams per square meter, suggesting a living space mechanism. Production data per unit of riffle area and total area showed greater differences among the three streams.

Behavior patterns of coho were investigated in aquaria and natural stream areas. Patterns demonstrated by coho included lateral display, threat, nipping, chasing, flight, hiding, fighting, submission, territorial defense, displacement activities, and hierarchy formation. Dominance in coho was organized on the basis of fish size. Groups of coho fry moving downstream in the spring following emergence were placed in artificial stream channels and controlled sections. If placed in channels or areas barren of resident coho, the fry tended to remain there. If added to existing resident groups of coho in artificial channels, the migrant fry were dominated by resident fish and tended to leave the channels. It was concluded that aggressive behavior of coho is one important factor governing population density in the stream environment, and hence is one factor determining production of coho.

Data on coho food habits in one stream showed that about 34 per cent of the annual diet was made up by terrestrial insect forms. Study of insect food habits indicated that about 52 per cent of the food ingested by coho prey was detritus of allochthonous origin, and 12 per cent was autochthonous algae. About 36 per cent could not be assigned to allochthonous or autochthonous sources. Application of aquatic insect food habit data to data on coho food habits indicated that about 66 per cent of the total energy intake leading to coho production was derived from allochthonous sources, either directly as terrestrial insects or indirectly as aquatic insects that fed upon terrestrial detritus. Seven per cent of the coho total energy intake was attributed to autochthonous sources, and 26 per cent could not be established as of allochthonous or autochthonous origin.

Production and yield data from the literature and present work, as well as the ecological implications of aggressive behavior, stream characteristics, and energy transfer are discussed.

Microfilm $2.95; Xerox $10.35. 227 pages.

BLACK SPRUCE ON THE PEATLANDS OF FORMER GLACIAL LAKE AGASSIZ AND ADJACENT AREAS IN MINNESOTA: A STUDY OF FOREST SITES, BOG PROCESSES, AND BOG TYPES.

(Order No. 61-3673)

Miron Lee Heinselman, Ph.D.
University of Minnesota, 1961

Two related ecological projects concerned chiefly with forest sites of the Lake Agassiz peatlands in northern Minnesota were conducted at the Lake States Forest Experiment Station between 1955 and 1959.

The first was a case study of black spruce sites in two bogs: Lindford Bog, located within Lake Agassiz, in Koochiching County, and Section 29 Lake Bog, located on the Laurentian Shield, in Lake County. Factors investigated included bog topography, groundwater levels, water movement, peat characteristics, peat depth, distance from margins, substrata, soil temperatures, and soil freezing. Site index was the dependent variable. Results of these studies are discussed, and the physiography, peat stratigraphy, and vegetation of each bog is interpreted.

Major conclusions are:

1. Depth to groundwater was correlated with site index only at Lindford, during low water.
2. At Lindford there was significant correlation with water table fluctuations.

3. Some good sites had stronger water movement than poor sites, but the correlation between water table slopes and site index was non-significant.
4. Distance from margins was negatively correlated with site index.
5. Peat depth had a low negative correlation with site index. Regressions were different for the two bogs.
6. Thickness of the upper horizon of raw Sphagnum was negatively correlated with site index. On good sites there was rapid transition to well-decomposed woody or mixed peats.
7. Soil temperatures at 6 inches were highest (by 2° - 6° F.) on poor sites during summer.
8. Soil frost was shallow and discontinuous, it thawed earlier on the poorest sites, and was rare after June. Permafrost was not found.
9. Basal forest peats over much of the Lindford Bog, including some very poor sites, suggest bog expansion and site deterioration. The radio-carbon age of 4360 years for the deepest peats places the start of this bog near the end of the Thermal Maximum.
10. The circulation of bog waters seems to be the master factor controlling forest sites, yet the hydrologic situation has itself been modified by peat accumulation in both bogs.

The second project, a study of bog processes and bog types within Lake Agassiz, was conducted as a survey of peat stratigraphy, physiography, and vegetation in key areas with pronounced vegetation patterns.

Widespread evidence of bog expansion, rising water tables, and site deterioration was encountered. Basal forest peats were found beneath the poorest muskegs, up to 2 miles from margins. Myrtle Lake, one of few bog lakes, seems to have risen some 14 feet with peat accumulation.

The identity of the "patterned" bogs and fens of this region was established. Features that clearly mark the Lake Agassiz peatlands as members of this circum-boreal group include string bogs (Strangmoor), topographically-oriented forest "islands," and fields of regularly-spaced islands.

The decisive influence of water movement patterns on floristics and forest sites was underscored. The key seems to be the degree of isolation from mineral-influenced groundwater. The course of such waters through bogs is often marked by "water track" vegetation types. A tentative classification of bog and fen types is proposed.

Theoretical implications of the findings are discussed. Neither the processes of bog expansion nor the patterned bogs and fens of the Lake Agassiz region fit the classical picture of succession in the Lake States. The author's views are: (1) Few bogs in this region are the result of a single successional sequence. (2) The bog types cannot be regarded as stages in an orderly "development" toward mesophytism. (3) Raising of bog surfaces by peat accumulation does not necessarily mean progression toward mesophytism. Such rises often cause concurrent rises of the water table, and promote site deterioration. (4) The climax concept does not contribute to understanding bog history. Microfilm $4.40; Xerox $15.55. 344 pages.

AGRICULTURE, PLANT CULTURE

INHERITANCE OF STEM RUST REACTION TO RACES 15B, 11, AND 56, IN CROSSES OF SOME VULGARE WHEATS.

(Order No. 61-3665)

Jamal Abdul-Karim Fuad, Ph.D.
University of Minnesota, 1961

Wheat stem rust, Puccinia graminis tritici, Ericks and Henn., is a continuous menace to wheat and causes great losses to wheat growers each year throughout the world. Breeding of disease resistant varieties is the only satisfactory method of controlling this disease. Many studies have been conducted for this purpose and much success has been attained in the development of resistant varieties. This work is complicated by the great diversity of the rust organism. Information on the inheritance of resistance to the prevalent races is important for the breeding of resistant strains of wheat. The present investigation is an attempt to accumulate more knowledge on the mode of inheritance in certain strains of vulgare wheats to three prevalent races of stem rust, i.e., 15B, 11, and 56.

Kenya Farmer is highly resistant to the three races of stem rust used, while Frontana was moderately resistant to races 15B and 11, and resistant to race 56. Hope was susceptible to races 15B and 11, but resistant to race 56. Prelude was susceptible to the three races used in this study.

The F_1, F_2, and F_3 plants from crosses of Kenya Farmer and Frontana with Hope were tested in the growth chamber to races 15B and 11 of stem rust. Backcrosses to either parent and their self progenies were tested to these two races in the greenhouse and in the growth chamber. The F_1 and F_2 plants from the Kenya Farmer X Prelude cross were tested to races 15B, 11, and 56, while those from the Frontana X Prelude cross were tested to race 15B only.

The results obtained suggested the presence in Kenya Farmer of two pairs of factors designated as KK and CC, for resistance to race 15B. Three other pairs of factors, termed K'K', C'C', and DD, were assumed to condition resistance in the same variety to race 11 of stem rust. These genes were partially dominant with cumulative effects. A test of independence showed that K and K' and C and C' were different. In Frontana, gene M was assumed to condition moderate resistance to race 15B, and genes M' and N to race 11 of stem rust. Gene H in Hope acted to raise the level of resistance with gene M for resistance to race 15B. It showed no such an effect in tests to race 11. A test of independence showed also that genes M and M' were different.

In Kenya Farmer X Prelude, the F_1 plants gave a mesothetic reaction to race 15B. A factor, termed P, was assumed to have been contributed by the Prelude parent which was partially dominant to genes K and C. The Frontana X Prelude cross showed that gene P was also partially dominant to gene M of Frontana when tested to race 15B.

The varieties used in this study, except Prelude, were resistant to race 56. Tests of the F_2 plants from crosses of Kenya Farmer and Frontana with Hope indicated that the same gene or genes may be responsible for reaction to race 56 in these three varieties. In the Kenya Farmer

X Prelude cross, the results indicated that two pairs of factors, called K''K'' and C''C'', were contributed by the Kenya Farmer parent. These genes were partially dominant with cumulative effects to race 56.

Microfilm $2.75; Xerox $6.40. 131 pages.

AN ECONOMIC AND ECOLOGICAL EVALUATION OF VELVETGRASS, HOLCUS LANATUS L.

(Order No. 61-3923)

Richard Harold Hart, Ph.D.
Oregon State University, 1961

Major Professor: W. S. McGuire

Velvetgrass is a common weed in western Oregon pastures. However, little was known about the conditions which favor or impede the establishment and increase of velvetgrass in a pasture, or about the value of velvetgrass for forage. In this study, a series of field and greenhouse experiments were carried out in an attempt to solve these problems.

Velvetgrass seeds were found to be capable of germinating immediately at maturity. However, some evidence was found for the development of secondary dormancy.

Velvetgrass seeds will germinate over a wide range of soil temperatures. Emergence was more rapid at higher soil temperatures, but the percentage of emergence was greater at lower temperatures.

Shading strongly inhibited the growth of velvetgrass seedlings. It had no effect on germination or emergence.

Velvetgrass exhibited a faster seedling growth rate than any of the five forage species tested. This may account for the great competitive ability of velvetgrass seedlings.

The ability of velvetgrass seedlings to survive winter temperatures was directly correlated with the weight of the seedlings. This suggests that velvetgrass invasion might be prevented if conditions in the pasture were such that the velvetgrass seedlings could not become large enough to survive the winter.

The application of lime to pasture plots containing velvetgrass resulted in a significant decrease in the amount of velvetgrass present. The application of 100 pounds of nitrogen per acre also produced a significant decrease in the amount of velvetgrass, but applying 200 pounds of nitrogen per acre had no effect. It appears that the response of the cultivated grasses to nitrogen is more rapid than the response of velvetgrass, but that velvetgrass continues to respond to the application of additional nitrogen longer than the cultivated grasses. The application of superphosphate had no effect on the amount of velvetgrass in the stand. All three fertilizers significantly increased forage yields.

When pasture plots were clipped periodically to a height of two inches, they were more susceptible to velvetgrass invasion than when clipped to a height of four inches. Clipping in late fall increased the susceptibility of the plots to velvetgrass invasion if a two-inch stubble was left, but had no effect if a four-inch stubble was left. The increased susceptibility to velvetgrass invasion which resulted from short or late fall clipping was due to the opening up of the stand, which allowed light to penetrate and reduced the ability of the forage grasses to compete for water and mineral nutrients.

Mature velvetgrass was found to be less palatable to grazing animals than most of the common forage grasses. No differences were found among the grasses when they were grazed before maturity.

Velvetgrass was similar to the cultivated grasses in chemical composition, but it had the lowest protein content of the five grasses analysed. Velvetgrass was also low in digestible nutrients; however, only perennial ryegrass was significantly higher.

Velvetgrass, because of its undesirable production pattern and low forage quality, should be controlled when it occurs in pastures. Herbicides should be used if the infestation is severe. A program of fertilization and controlled grazing, to increase the ability of the desirable species to compete with velvetgrass, should be employed to control light infestations and prevent the invasion of pastures which are free of velvetgrass.

Microfilm $2.75; Xerox $4.60. 88 pages.

GROWTH CHARACTERISTICS OF CRESTED WHEATGRASS, Agropyron desertorum (Fisch.) Schult., IN THE BIG SAGEBRUSH-BLUEBUNCH WHEATGRASS PROVINCE OF SOUTHEASTERN OREGON.

(Order No. 61-3925)

Donald Nelson Hyder, Ph.D.
Oregon State University, 1961

Major Professor: Charles E. Poulton

Growth characteristics of standard crested wheatgrass were investigated at the Squaw Butte Experiment Station from 1955 to 1960. The primary purposes were to describe seasonal trends in growth and evaluate the effects of herbage removal at different seasons.

Growth rates were slow in April, increased in May, reached maximum in early June, decreased during June, and terminated in June or early July. The herbage was 6 inches tall about May 1; the heads were in boot development in late May and emerged in early June; anthesis occurred from June 25 to July 5; the herbage lost green color in July; and the seed were hard about July 20. Herbage yields and the duration of active growth depended largely upon the amount of precipitation.

Herbage dry-matter contents increased from 28 percent in early May to 74 percent in late August. Crude-protein contents decreased from 14 percent in early May to 3 percent in late August. Crude-protein yields were maximum about mid-June. Nitrogen translocation to underground parts was indicated by a significant negative correlation between concentrations in herbage and roots. The concentrations and yields of phosphorus and potassium followed seasonal trends that were chronologically similar to those for nitrogen.

Root growth was most active in April and terminated about June 1. Carbohydrate reserves accumulated in May, decreased slightly in June, and increased in July. Nitrogen

fertilization resulted in the mobilization of carbohydrate reserves prior to head emergence.

Clipping at ground level a single time reduced root growth, herbage yields, and autumn-carbohydrate concentrations most when applied, respectively, in late-April, mid-May, and in mid-June. Timing herbage removal to cause strong effects upon herbage yields minimized the effects upon underground parts because (a) root growth was nearing termination; (b) carbohydrate stores were seasonally high; and (c) the strong yield reductions were in culm elongation and seed production.

Nitrogen fertilization increased percentage herbage-growth rates prior to mid-May. Increases in hay-stage yields attributed to fertilization accumulated largely in the period after mid-May. The early-season difference in percentage growth rates was called direct-nitrogen-response, which was associated with (a) carbohydrate mobilization, (b) higher contents of moisture, N, P, and K, and (c) a greater occurrence of reproductive differentiation in the growing points. Nitrogen fertilization would be of most value on areas grazed only after the heads-in-boot stage of development, because (a) maximum increases in forage would be obtained; (b) root growth and carbohydrate storage would be improved; and (c) the improvement in nutritive quality would be more likely to increase animal daily gains. Nitrogen fertilization could not be proposed for promoting either earlier grazing or heavier stocking rates prior to mid-May.

Information about the growth characteristics of crested wheatgrass was interpreted for basic concepts important in grazing management. To obtain an optimum amount of feed value per acre, grazing could begin at the heads-in-boot stage of development and terminate at anthesis. This proposal was termed one-crop grazing. To obtain an optimum amount of early use, grazing could begin at the 6-inch-leaf-height stage and terminate at the heads-in-boot stage. This proposal was termed two-crop grazing because proper timing and degree of utilization would stop growth in first-crop stems and permit second-crop growth composed of new tillers. To obtain an optimum length of grazing season, grazing could begin on pastures managed for two-crop grazing and alternate to pastures managed for one-crop grazing. This proposal was termed rotation grazing because it included rotation in the order of use among years. Microfilm $2.75; Xerox $8.00. 171 pages.

ASSOCIATION OF VARIOUS PLANT CONSTITUENTS AND MORPHOLOGICAL CHARACTERS WITH THE WINTERHARDINESS OF ALFALFA, MEDICAGO SATIVA L.

(Order No. 61-3129)

Kenneth Leroy Larson, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Dale Smith

The association of various plant constituents and morphological characters with the winter survival of ten alfalfa varieties was studied at Madison, Wisconsin, during 1959 and 1960. The investigation was undertaken to test the reliability of a number of methods that have been suggested to measure winterhardiness.

Alfalfa varieties used had been ranked previously for winterhardiness under field conditions. This was done in individual plant nurseries during 1956 to 1958. Varieties ranged from moderately hardy (DuPuits) to very hardy (Teton).

Measurements of morphological characters were made on spaced plants during October of the seedling year following removal of the top growth during early September. Percentages of extra tall and short growing plants in the variety populations, type of recovery growth (decumbent or erect), and average plant height were correlated closely with winterhardiness. Extra tall plants were the least hardy while the short plants were the most hardy. Crown weight was correlated significantly with winterhardiness although several discrepancies in the ranking of the varieties would limit its use. Percentages of medium and tall growing plants in the variety populations, root weight, crown width, and root branching were not correlated closely with winterhardiness.

Pentosan content, sulfhydryl groups, drip (liquid that exuded from thawing plant tissue), and chlorophyll stability in the leaf tissue removed from the field during mid-August, early to late September, and mid-October of the seedling year of 1959 were not found to be associated with winterhardiness.

Exosmosed and total electrolytes, total available carbohydrates, reducing sugars, total sugars, starch, water insoluble nitrogen, water soluble protein nitrogen, water soluble non-protein nitrogen, total nitrogen (dry and wet weight basis), phosphorus, potassium, calcium, magnesium, and sodium were determined in the roots and crowns of alfalfa plants removed from the field during mid-August, early October, and late November of the seedling years of 1959 and 1960. Specific conductance of exosmosed electrolytes from plants frozen after removal from the field during late November, after the plants had undergone hardening, proved to be of value in differentiating varieties of fairly wide differences in winterhardiness. The procedure was not accurate enough to measure small differences in winterhardiness, despite the highly significant correlations between specific conductance of exosmosed electrolytes and winter injury. Specific conductance of exosmosed electrolytes, when expressed as percentage of the specific conductance of total electrolytes during November, was as reliable as the specific conductance of the exosmosed electrolytes in differentiating the alfalfa varieties for winterhardiness. The concentrations of the remaining constituents analyzed in the roots and crowns were not correlated consistently with winterhardiness, and would not be reliable measures in differentiating very hardy from moderately hardy alfalfa varieties.

The nitrogenous constituent most associated with winterhardiness was water soluble protein nitrogen. However, obvious discrepancies existed in the ranking of the varieties even though a close association was shown between water soluble protein nitrogen during November in 1960 and winterhardiness.

Recovery and survival in the greenhouse following artificial freezing (-8°C for 20 hours) of plants removed from the field during mid-August, early October, and late November of the seedling year were not consistently reliable measures in estimating winterhardiness. Plants sampled during mid-August and early October were killed by the freezing treatment, whereas, plants sampled during November had hardened and were injured less by the freezing treatment. However, vigor and dry weight of the recovery

top growth and percent of plants killed following freezing during late November did not differentiate accurately the hardy from the less hardy varieties during one of the two years.

Hardy and less hardy varieties of alfalfa could not be differentiated accurately by percent of seed germination in 3 different concentrations of mannitol, expressed on the basis of germination in distilled water as 100%. A tendency for the less hardy varieties to germinate more rapidly and more completely than the more hardy varieties existed but exceptions in the winterhardiness ranking of varieties were noted.

Microfilm $2.75; Xerox $5.40. 110 pages.

SOIL MANAGEMENT STUDIES OF THE CLAYPAN SOILS OF SOUTHERN ILLINOIS WITH EMPHASIS ON DRAINAGE AND AERATION

(Order No. 61-4343)

Clifford K Martin, Ph.D.
University of Illinois, 1961

The objective of this study was to improve subsurface drainage in claypan soils of southern Illinois by increasing the effective pore space.

Three consecutive installations were established at Raleigh, Carbondale, and Brownstown, respectively in 1957, 1958, and 1959. Deep-rooted legumes in rotation at full treatment for 47 years at Raleigh produced no significant indications of increased porosity; however, with plow layers of equal fertility, yields of alfalfa were significantly superior on the subplow layer of long-term treatment than on that of the check. Observations at Carbondale indicated that introduced biological agents, alfalfa and earthworms, L. terrestris, produced additional porosity; but comparisons of extra large amounts of limestone, stable manure, and chiseling did not influence these biological agents sufficiently to affect drainage. Drainage wells installed at Carbondale to provide drainage and aeration for the biological agents by pumping were found to function by downward movement. Drainage wells established at Brownstown of sufficient depth to contact a permeable substratum which in turn was relieved of the water pressure by relief wells leading to a deep tile line successfully improved the subsurface drainage of this claypan soil.

Microfilm $2.75; Xerox $8.00. 171 pages.

FACTORS INFLUENCING SURVIVAL OF TALL FESCUE (FESTUCA ARUNDINACEA SCHREB.) PROPAGULES.

(Order No. 61-3932)

James Earl Miltimore, Ph.D.
Oregon State University, 1961

Major Professor: J. Ritchie Cowan

Factors affecting tall fescue vegetative propagation were studied in the greenhouse to determine the extent and nature of influences that affected propagule survival. Constant temperature treatments of 90°, 80°, 75° F. were less favorable when compared to the 70° and 60° F. treatments. The day and night differential temperatures of 75° - 50° F. and 70° - 60° F. were superior to 70° F.

Propagules grew satisfactorily in a distilled water medium to which had been added hormones in concentrations from 1 to 81 ppm. Genotypes differed greatly in their response to hormones.

During the period from April to December propagule growth was greatest for all genotypes in either April or September. A photoperiod effect was suggested either on the propagules after planting or on the clones prior to propagation.

There were no significant differences in growth when propagule lengths were varied but the longer propagules produced most growth. There was no difference between growth produced by the longest propagule treatment and the treatment in which propagules were trimmed to the top of the basal leaf sheath. The preparation of propagules with all roots removed did not reduce growth. Propagules prepared with two and three culms were more vigorous than propagules prepared with one culm.

Genotypes varied in growth when planting weights were uniform. When planting weight was varied the larger propagules within genotypes produced more growth than the smaller propagules but the increase in growth varied between genotypes. The age of the tillers did not significantly affect growth of propagules made from them. The number of tillers produced by genotypes ranged from 13 to 39 during a four month period. Genotypes that produced larger tillers produced fewer tillers during the period.

Genotypes differed significantly with respect to all criteria measured. With respect to survival the proportion of genetic to total variance varied from 1 to 79 per cent for two progeny groups with an average of 57 per cent for 75 genotypes. Selection for genotypes with high capacity to survive would be important if genotypes were to be propagated commercially.

The planting weight and leaf and root production per surviving propagule were higher for genotypes with higher survival rates. It was suggested that planting weight influenced survival because large propagules were less subject to physical injury during preparation and planting and because of the greater energy supply in the larger propagules. Microfilm $2.75; Xerox $5.00. 100 pages.

THE EFFECTS OF X-RAYS ON THE RECOMBINATION OF LINKED CHARACTERS IN THE TOMATO

(Order No. 61-3244)

Donald Kenneth Ourecky, Ph.D.
Washington State University, 1961

Chairman: Thomas E. Randall

There are desirable characters in many plant species which would be of economic value if close linkage to genes for undesirable characters did not reduce the probability of bringing together the desirable genes. In certain organisms x-rays have been observed to increase significantly the frequency of recombination. A study was made

to determine if x-rays would increase the frequency of recombination of characters in the tomato and therefore provide a practical and economic method to be used in tomato breeding.

Five linked genes located in chromosome 2 were selected for study namely, d (dwarf plant height vs tall plant height D); p (pubescent fruit vs smooth fruit P); o (ovate-fruit shape vs round fruit shape O); s (compound inflorescence vs simple inflorescence S); and bk (non-beaked fruit vs beaked fruit Bk).

The Sioux variety and a recessive selection were used as parents. F_1 plants were grown in flower pots, in which the first flower trusses were irradiated with x-rays doses of 500 r, 100 r, and 1500 r, at three stages of flower bud development. A backcross population of 100 plants was grown from each stage and treatment.

Irradiation significantly reduced the percentage of normal pollen grains. As the irradiation treatment increased the number of normal pollen grains decreased from 100.0% in the check treatment to 77.5% in the 1500 r treatment. Irradiation did not affect the seed germination percentage nor the length of time required for the backcross seed to germinate. No significant differences were observed in the irradiation treatments as to the number of chiasmata formed in chromosome 2. An average of 2.2 chiasmata was observed for all treatments and stages.

The results indicated that x-ray doses of 500 - 1500 r, when applied to an inflorescence, did not affect the recombination values for the five linked genes. The average observed recombination values for the d-p, p-o, o-s, and s-bk regions were 2.6, 7.4, 18.1, and 1.3 respectively. Backcross ratios were obtained which showed a marked reduction in the number of recessive parental genotypes recovered when compared to the number expected. A decrease in recombination values was observed in all regions compared to the values reported in the literature. Among the recombination genotypes, the frequencies of those containing the s gene were reduced in comparison to their corresponding recombination class.

A tentative hypothesis involving a small inversion in the s-bk region was proposed. Therefore, an increase in the frequency of certain three-strand double crossover combinations, between the centromere and the inversion loop, could explain the over-all reduction in recombination frequency, the unexpected monogenic ratios and the extreme reduction in recombination for the s-bk region.

Microfilm $2.75; Xerox $4.00. 73 pages.

PHYSICAL AND BIOCHEMICAL STUDIES ON CORE BREAKDOWN OF BARTLETT PEARS STORED IN CONTROLLED ATMOSPHERES

(Order No. 61-3251)

Max W. Williams, Ph.D.
Washington State University, 1961

Chairman: Thais A. Merrill

Bartlett pears were obtained from the Tree Fruit Experiment Station plots at Wenatchee, Washington, during the 1959 and 1960 pear harvests and stored in air and various levels of CO_2 at 31°F for several months to try to distinguish between CO_2 induced and senescent core breakdown in the fruit. Various physical and biochemical tests were conducted on the fruit throughout storage and subsequent ripening, in an attempt to determine the underlying causes of the two disorders.

A visual distinction was made between the two disorders, mainly by the type of injury and when and where it occurred. Senescent core breakdown always developed after the respiratory climacteric peak was passed, the senescent injury was characterized by its soft watery, brown appearance and by the fact that it always started in the area around the vestigial style at the calyx end of the fruit. The CO_2 induced breakdown, on the other hand, developed in fruit that were still hard and green before the climacteric peak was reached. The CO_2 injury was characterized by its dry pithy appearance and a certain leathery hardness of the tissue. It usually developed in the center or at the stem end of the core and was often present in the flesh tissue. The CO_2 injury was never observed to be present in the area around the vestigial style at the calyx end of the fruit.

A method was developed for sampling and accurately measuring the CO_2 and O_2 levels in the core area of a pear fruit. The internal atmosphere data obtained show that CO_2 induced brown core and senescent brown core do not develop due to abnormally low levels of O_2 inside the fruit. Therefore, the theory that core breakdown is primarily due to the accumulation of the products of anaerobic respiration is questioned. It was found that the internal level of CO_2 in the pears was closely associated with the respiratory activity of the fruit. The highest levels of CO_2 and lowest O_2 levels were reached when the fruit was at its respiratory climacteric peak. During storage the CO_2 levels in the fruit were never more than 2 or 3% higher than those of the storage atmosphere. After removal of the fruit from the storage with high levels of CO_2 into air at higher temperatures the CO_2 level inside the fruit dropped off sharply.

A rapid method for the quantitative estimation of the major non-volatile organic acids in plant tissues is described. The method employs ion exchange and paper chromatographic techniques. The data obtained with the method on Bartlett pear acids show that when the fruit is stored in CO_2, succinic and citric acids accumulate in the tissues. The higher the CO_2 level in the storage atmosphere, the greater was the acid buildup in the tissues. The increase in succinic acid was found to be correlated with CO_2 injury in the fruit.

The browning of the tissue observed in the two disorders was attributed to the presence of phenols in the fruit. It was found that the core tissue of Bartlett pears contained twice as much phenolic material as the flesh tissue. The major component of these phenols was observed to be the leuco-anthocyanins. The phenols are believed to be secondary factors in core breakdown.

The series of events leading to CO_2 induced brown core and senescent brown core in Bartlett pears are considered to be quite different. However, once cell disorganization takes place the subsequent sequence of events in both cases seem to be very similar.

Microfilm $2.75; Xerox $5.20. 102 pages.

AGRICULTURE, PLANT PATHOLOGY

STUDIES ON THE SULFUR NUTRITION OF APHANOMYCES EUTEICHES AND ITS RELATIONSHIP TO ROOT ROT OF PEAS

(Order No. 61-3699)

William A. Haglund, Ph.D.
University of Minnesota, 1960

Adviser: T. H. King

Ten isolates of Aphanomyces euteiches were studied to determine their sulfur requirements in a basic medium containing d-glucose, l-asparagine and inorganic salts. The 10 sulfur containing compounds were assayed for their growth promoting activity at 3 concentrations equivalent to 5, 10, 20 ppm of elemental sulfur. Methionine, cystine and sodium thiosulfate supported growth of this fungus at the 3 concentrations studied, however the growth in the medium containing sodium thiosulfate was less than occurred in the medium containing l-methionine and l-cystine. Thiourea was toxic to A. euteiches at a concentration of 20 ppm but supported very good growth of the fungus at 5 and 10 ppm of elemental sulfur.

The 10 isolates of A. euteiches used in these studies varied greatly in their pathogenicity on peas and were originally collected from a wide geographical area, including the states of Minnesota, Wisconsin and New York. However in these studies all of the isolates had the same sulfur requirement.

After it was discovered that A. euteiches required a reduced form of sulfur for growth studies were made to determine if this nutrient requirement was related to pathogenicity. Seed tissue and cotyledon tissue from 10 day old seedlings of 9 commercial varieties of peas susceptible to Aphanomyces root rot and 6 Minnesota breeding lines of peas resistant to this disease were bioassayed for their growth promoting activity in a medium deficient in sulfur. It was determined by these studies that the growth promoting activity of the plant tissue was related to resistance of the peas to common root rot. The tissue from the susceptible lines of peas consistently supported more growth of the fungus than the tissue from the resistant selections.

The growth of the isolates in the pea tissue medium was related to the virulence of that specific isolate. In all of the studies the most virulent isolate produced the most growth and conversely the least pathogenic isolate produced the smallest amount of growth.

Microfilm $2.75; Xerox $3.00. 51 pages.

INDUCED HYBRIDIZATION BETWEEN CERTAIN GRAMINICOLOUS SPECIES OF USTILAGO

(Order No. 61-3237)

James Allen Hoffmann, Ph.D.
Washington State University, 1961

Chairman: George W. Fischer

In order to study the inheritance of spore and sorus characters in interspecific hybrids of Ustilago and to explore the potentialities of hybridization in the production of new morphologic "species," the following crosses were attempted: Ustilago avenae hordei X U. striiformis hordei, U. avenae hordei X U. trebouxii, U. bullata X U. trebouxii, U. hordei X U. bullata, U. hordei X U. striiformis hordei, U. hordei X U. trebouxii, and U. trebouxii X U. striiformis hordei.

Inoculations of grasses susceptible to both smut parents with compatible combinations of monosporidial lines resulted in hybrid teliospores only in crosses of Ustilago hordei X U. bullata and U. bullata X U. trebouxii.

Inasmuch as Ustilago hordei and U. bullata are both head smuts, only contrasting spore characters were available for study in crosses between these species. Spores of the U. hordei parent are small (5-9 μ), smooth, and lighter-colored on one side; those of U. bullata are larger (7-11 μ), verrucose, and, in most collections, lighter-colored on two sides.

The F_1 teliospores were echinulate, mostly lighter-colored on two sides, and intermediate in size. The hybrid spores germinated readily, but lysis of the promycelia and sporidia defeated attempts to obtain complete sets of monosporidial lines. Therefore, hybrid teliospores were used as inoculum to obtain subsequent generations.

Segregation in the F_2 produced not only parental types, but also a number of types unlike either parent. Most F_2 sori contained spores that were more or less echinulate and lighter-colored on one or two sides. In size, the spores ranged from smaller than Ustilago hordei to larger than U. bullata. Teliospores of representative F_2 segregates were used to obtain F_3 hybrids; representative F_3 types were then used to obtain fourth generations. In some cases, the F_3 and F_4 hybrids resembled their respective F_2 or F_3 parents; in others, segregation occurred to produce a number of different types such as appeared in the F_2. In a few instances, segregates appeared which possessed entirely unique characteristics, not attributable, phenotypically, to either parent.

Contrasting sorus and spore characters were both available for study in crosses between Ustilago bullata and U. trebouxii. The F_1 sori resembled both parents but, in being confined to the inflorescence, were more characteristic of U. bullata. The F_1 spores were minutely echinulate (but more prominently so than the U. trebouxii parent), distinctly lighter-colored on two sides, and intermediate between the parents in size. Hybrid spores were used to produce succeeding generations. Only two of the hybrids produced F_2 sori; these were limited, in each case, to a single plant. In contrast to the F_1, the F_2 sori were striate and foliicolous, resembling the U. trebouxii parent. The F_2 spores, except for their larger size, resembled those of the F_1. The F_3 and F_4 sori and spores were generally similar to those appearing in the F_2. Some of the F_3 and F_4 spores possessed hyaline polar "caps" suggestive of U. spegazzinii var. agrestis.

Some of the segregates recovered in these crosses were sufficiently distinct with regard to spore morphology to be considered as independent species. This production of new morphologic types by hybridization, experimentally, is indicative that new species may originate likewise in nature.

The predominance of intermediate types and the gradation of characters from one parental extreme to the other suggested that most of the characters studied were governed by multiple factors. Populations in the segregating generations were too small to permit ratio studies.

Microfilm $2.75; Xerox $4.60. 87 pages.

ECOLOGY OF LONGIDORUS MENTHASOLANUS, KONICEK AND JENSEN 1961, A PARASITE OF PEPPERMINT IN OREGON.

(Order No. 61-3927)

Donald Edward Konicek, Ph.D.
Oregon State University, 1961

Major Professor: Harold J. Jensen

The mint nematode previously reported by Jensen and Horner as Longidorus sylphus is described as a new species, Longidorus menthasolanus. The discovery of males, the slightly set off lip region, and the bluntly convex-conoid female tail clearly distinguish the new species from L. sylphus. Life cycle studies indicate that the nematode requires approximately seven weeks to develop from first-stage larva to adult. Damage in peppermint fields ranges from a trace to the development of large barren areas. The plants that die in these areas are probably not killed directly by the pest, but rather by the inability of the plant to take up sufficient nutrients and water because the roots have been destroyed. Eight plants out of twenty tested were suitable host plants: bean, clover (alsike and ladino), Marion bluegrass, peppermint and wheat. A field survey taken for a period of one year (1958-1959) indicated the population peak reached in November and December was probably a false one due to inadequate sampling and certain cultural practices. Actually the greatest number of nematodes occurred between April and August. Most (81.2%) of the nematodes were found in the upper six inches of soil, few (14.4%) were found in 6-12'' soil depths. Temperature studies indicate that the most favorable soil temperature for development of L. menthasolanus at 13 per cent and 27 per cent soil moisture was between 25° and 35° C. (being close to 30° C.). Nematodes were unable to survive in saturated soil at temperatures above 25° C., and only a few survived at 25°, 20°, 15° and 10° C. A few nematodes survived soil temperatures of -1°, -19° and -70° C.; however, 98 per cent of the nematodes were killed when frozen. Desiccation experiments indicated that few nematodes survive in soil moistures from 2.4 per cent down to 0.7 per cent, and none at 0.7 per cent soil moisture. Microfilm $2.75; Xerox $3.60. 65 pages.

SURVIVAL AND PATHOGENICITY OF PHYTOPHTHORA CINNAMOMI RANDS IN FOREST SOILS

(Order No. 61-3928)

Elmer George Kuhlman, Ph.D.
Oregon State University, 1961

Major Professor: Lewis F. Roth

Phytophthora cinnamomi Rands has been recognized as a threat to the Douglas-fir forests of the Pacific Northwest ever since the fungus was first shown to be pathogenic to this species. The survival and movement of the fungus in the soil, and the conditions required for infection of Douglas-fir seedlings were studied in order to assess the danger from this disease.

Mycelial growth occurred in sterile soil at moisture contents of 43 and 58% at 15°, 20°, and 25°C whereas in non-sterile soil no growth occurred at any of the temperatures or moisture levels. Zoospores were able to move up to three inches in a non-sterile soil filtrate. Movement of the fungus in the field was detected only very sporadically. P. cinnamomi probably is dependent on soil water movement for dissemination to susceptible host plants.

A general fungistasis for mycelial growth was demonstrated in both cultivated and forest soils. Mycelial growth of P. cinnamomi, Rhizoctonia sp., Helminthosporium sp., Fusarium sp. and a Pythium sp. isolated from forest soil was inhibited by substances produced in the soil. The inhibition of the Pythium sp. was less than that of P. cinnamomi. P. cinnamomi mycelial growth was inhibited throughout the year.

Mycelium and chlamydospores of P. cinnamomi survived very poorly in artificially infested soil. After twenty months the fungus could be recovered in only one treatment out of twenty. The soil microflora influenced the rate of survival; in soils containing a Pythium sp. recovery of the fungus was less after only two months than in other soils. A heavy clay soil retained a higher inoculum level but the length of survival was not increased. The presence of Douglas-fir seedlings did not lengthen the survival.

P. cinnamomi died in dry soil. In the greenhouse the fungus was dead after the soil was dried for two months at 20°-25°C. In the field each summer drought greatly reduced the inoculum level in infested soil.

The competitive saprophytic ability of P. cinnamomi was low in both forest and cultivated soils. When the ratio of infested sand-meal/soil was less than 50/50 invasion of Douglas-fir twigs was sparse. Saprophytic invasion occurred less frequently in mixtures of forest soil with inoculum, possibly indicating a suppression of P. cinnamomi.

A microscopic study of infected Douglas-fir roots failed to reveal any resistant structures produced by the fungus. Oospores are produced in an apparent response to a chemical in avocado root tissue.

Sporangial formation and discharge occurred from 15° to 30°C. The number of sporangia formed at 15°C was nearly ten times less than the number at 20°C. Three different soil filtrates stimulated sporangial production.

Soil temperatures at or above 16°C were required for infection of Douglas-fir and Port Orford cedar seedlings by P. cinnamomi. Maximum infection of Douglas-fir occurred at 24° and 28°C. Heat injury affected both inoculated and uninoculated seedlings at 32°C. Less infection occurred at 20°C.

P. cinnamomi should not be considered a serious threat to the Douglas-fir forests of the Pacific Northwest under normal climatic conditions since soil temperatures are normally too low during periods of high soil moisture for infection to occur. Exclusion of this pathogen from forests of this region is advisable to insure that this disease does not become a problem. Widespread incipient infections could create an epiphytotic if the environmental conditions became favorable for the pathogen or if the pathogen became adapted to the environment.

Microfilm $2.75; Xerox $5.20. 103 pages.

THE SELECTIVE ACTION OF A GROWTH REGULATOR HERBICIDE ON STRAINS OF BINDWEED (Convolvulus arvensis L.).

(Order No. 61-3250)

Joseph Wayne Whitworth, Ph.D.
Washington State University, 1961

Chairman: Thomas J. Muzik

Strains of bindweed differing in susceptibility to foliage applications of 2,4-D were selected from a previous screening trial and used in testing some of the theories of selectivity.

The broad differences that were found in external morphology such as the degree of pubescence and the number of stomata showed no relationship to the selective action of the herbicide 2,4-D. Entry of the chemical into the plant and translocation within the stem were also not critical factors.

By the use of tissue culture methods, it was possible to demonstrate that the most profound differences between resistant and susceptible strains of bindweed occurred at the cellular level. When incubated in a nutrient agar containing 2,4-D, excised stem sections of both strains produced callus tissue but the callus of the susceptible, as compared to the resistant, was approximately double in volume, dry weight, and the degree of hydration. With increasing age, stem sections of the susceptible became even more responsive; just the reverse was true for the resistant.

Varying the levels of calcium and the use of analogs of adenine, uracil, giberellic acid and kinetin did not protect the plants against the action of 2,4-D or alter differential response of the two strains.

Microfilm $2.75; Xerox $4.80. 93 pages.

ANATOMY

EFFERENT CORTICONUCLEAR PATHWAYS IN THE CEREBELLUM OF THE CAT

(Order No. 61-3503)

Robert Paul Eager, Ph.D.
University of Pennsylvania, 1961

Supervisor: James M. Sprague, Ph.D.

Previous Marchi studies have suggested a division of the cerebellum into three bilaterally symmetrical, non-overlapping, longitudinal corticonuclear zones, with vermal cortex projecting to the fastigial nuclei, paravermal cortex to interposed nuclei and lateral cortex to the dentate nuclei. These were visualized as simple radial projections in a medio-lateral as well as rostro-caudal fashion. These pathways were reinvestigated, with small lesions placed in one or another of the zones described and the resultant degeneration stained by means of the Nauta-Laidlaw silver technique. The latter is superior to the Marchi in that degenerating axoplasm is stained selectively, allowing a more extensive visualization of the finer, unmyelinated terminal ramifications.

The folium and tuber vermis (VIIA and VIIB) were found to connect efferently with the fastigial nuclei, as well as with Deiter's vestibular nucleus. The pattern of projection followed the previous Marchi results closely.

The results of lesions in the paravermal cortex differed, depending upon where in this zone the lesion was placed. Lesions placed medially within the paravermal zone of the anterior lobe (lobule V, culmen) resulted in degeneration restricted to the ipsilateral nucleus interpositus, with an additional projection to the lateral vestibular nucleus (Deiter's). Degeneration was found throughout the rostro-caudal extent of the interpositus. A lesion placed in the lateralmost cortex of culmen (lobule V) gave degeneration to all three homolateral cerebellar nuclei, throughout their length, as well as to Deiter's. A leison placed laterally in lobulus simplex gave degeneration to both the dentate and interpositus nuclei on the same side, as well as to Deiter's nucleus. In an animal with a more medially placed lesion, fibers were traced to the ipsilateral vestibular nuclei, to the ipsilateral interpositus nucleus, and to the caudal parts of the fastigial nucleus, on the same side. The paramedian lobule was found to project ipsilaterally to the rostral pole of the dentate nucleus, via a lateral, extranuclear path; to the entire nucleus interpositus (heaviest in posterior parts); and to the more caudal parts of the dentate nucleus. In addition, it sends fibers bilaterally to end in the caudal 1/3 of the fastigial nuclei.

Lateral, hemispheral, areas differed in their connections, depending on where the lesion was placed. Lesions placed far laterally in crus I of the ansiform lobule gave degeneration to the dentate nucleus throughout its length, as well as to more caudal parts of the nucleus interpositus. A laterally placed lesion of crus II gave degenerating fibers to the same nuclei, but in addition, gave off an extensive number of crossed association fibers which passed to the contralateral folia of crus II, the paramedian lobule, and the dorsal paraflocculus. Lesions placed in medial crural areas resulted in a pattern of degeneration which was strikingly similar to that found in cases of lesions in the paramedian lobule, that is, with a projection to the rostral pole of the dentate, projections to both the dentate and interpositus, and a bilateral projection to the caudal parts of the fastigial nuclei. A lesion of the anterior dorsal paraflocculus resulted in degeneration to the ventrolateral aspect of the dentate nucleus, in more rostral sections. The caudal dorsal paraflocculus, on the other hand, was found to project to both the dentate and interposed nuclei, as well as to the caudal parts of both fastigial nuclei.

The present results indicate that concepts of a simple radial projection system from cortex to specific cerebellar nuclei, as postulated by a number of previous

investigators, are not valid in all respects. A correlation is also made between the present anatomical results and the results of recent physiological investigations.

Microfilm $2.75; Xerox $4.60. 90 pages.

AN ELECTRON MICROSCOPIC STUDY OF THE CORNEA IN RELATION TO THE UPTAKE AND TRANSPORT OF COLLOIDAL PARTICLES

(Order No. 61-3443)

Gordon Israel Kaye, Ph.D.
Columbia University, 1961

Physiological studies by Maurice (1951, 1957, 1960), Davson (1949), Langham (1952, 1954), Cogan and Kinsey (1942) and Kinsey and Cogan (1942) have demonstrated that ions, as well as larger molecules such as hemoglobin or fluorescein, can diffuse across and within the cornea. Donn, Maurice and Mills (1959) have measured a transcorneal electrical potential in vitro and demonstrated that this potential is related to the "active" transport of Na ions from the epithelial surface across the cornea.

Pirie and Van Heyningen (1956) suggested that most of the substrates for corneal metabolism are obtained from the aqueous humor filling the anterior chamber. In order to receive its nutrients and in order to maintain its normal conditions of hydration the avascular cornea must transport relatively large amounts of solute and solvent across the cellular layers which cover this structure.

It has been suggested by Palade (1953, 1960), Wissig (1958) and Brandt (1960) that there may be a morphological basis for the transport of large amounts of solvents and solutes by cells by the mechanism of pinocytosis. The use of electron-opaque markers to study fluid movements at the electron microscope magnification level was described by Wissig (1958), in studies of the transport of colloidal particles across the capillary endothelium.

The present study describes the morphology at the electron microscope magnification level of the normal rabbit and frog corneas and describes the pathway of transport of colloidal particles by the cornea in vivo and in vitro.

Rabbit and frog corneal endothelia were exposed in vivo to suspensions of ThO_2, saccharated iron oxide, or ferritin by injection of the material into the anterior chamber. In other experiments ThO_2 or saccharated iron oxide was injected into the corneal stroma, producing a small bleb. In vitro studies were carried out on intact corneas of adult rabbits in a chamber described by Donn, Maurice and Mills (1959) in which the epithelial or endothelial surfaces of the cornea were exposed to ThO_2 or saccharated iron oxide under various conditions.

Particles presented at the aqueous humor surface of the rabbit corneal endothelium are first attached to the cell surface and then pinodytosed. Particles do not appear to pass between the cells in the region of the terminal bars although considerable numbers of particles are found in the intercellular space basal to the terminal bar. It appears that the particles are carried around the terminal bar by an intracellular pathway involving the pinocytosis of the particles and their subsequent transport to the lateral cell margin basal to the terminal bar. In the frog corneal endothelium, in which no terminal bar is normally found, the principle pathway of transport appears to be intercellular although considerable surface attachment of particles and some pinocytosis is found.

Particles introduced at the basal surface of the endothelium (via blebs in the corneal stroma) are apparently carried through the endothelial cells in membrane-bound vesicles without appearing in the intercellular space. There appears to be free diffusion of these particles (50-100A° in diameter) through Descemet's membrane and the corneal stroma. The stromal cells appear to take up large quantities of the particles when blebs are injected into the stroma.

Indications that this transport is an active process are presented by the different pathways of transport into or out of the corneal stroma as well as by the great reduction in transport activity at low temperatures.

Microfilm $3.15; Xerox $11.05. 244 pages.

STUDIES ON THE GENITAL SYSTEMS AND REPRODUCTION IN THE CHIMAEROID FISH HYDROLAGUS COLLIEI (LAY AND BENNETT).

(Order No. 61-3940)

Hugh Palmerlee Stanley, Ph.D.
Oregon State University, 1961

Major Professor: Howard H. Hillemann

A study of the anatomy and histology of the urogenital organs of Hydrolagus colliei from hatching stage to maturity is presented. Data are given which indicate that this species spawns at all seasons of the year. From 12 to 35% of adult females are reproductively active at any given time, while adult males are continuously active. There is a high degree of symmetry in the weight of the gonads in either sex, although the two ovaries of an individual female may differ widely in weight.

New germ cells are incorporated into ampullae at the base of a single, small germinal projection on the dorsolateral aspect of the testis. Maturing ampullae migrate progressively across the testis and discharge their matured products into the efferent ductules at the flat medioventral face of the testis. An hypothesis is advanced to the effect that there is a very early association of one Sertoli cell with one spermatogonium, and that a constant number of mitotic and meiotic divisions produces the uniform number of sixty-four spermatozoa found in each bundle.

The efferent duct system of the testis of H. colliei corresponds with that in the elasmobranch fishes. A longitudinal testis canal and a kidney-edge-canal (Nierenrandkanal) are differentiated to varying degrees. Connections exist between the latter canal and the anterior few segments of the opisthonephros. Only a single one of these connections (most anterior) is transformed in Hydrolagus into a part of the epididymis, the sexual portion of the kidney (Geshlechtsniere). The chambered ampulla ductus deferentis is very complex and its lining epithelium is differentiated into several different secretory portions. The ampulla develops a heavy, circularly arranged muscularis, presumably functioning in the ejaculation of spermatozoa and seminal fluids at the time of copulation.

A distinct single median organ functions as a urogenital sinus in males and as a urinary sinus in females; these are apparently homologous. Distinctive cells, possibly of a neuroepithelial nature, are included within the epithelial lining of these two organs. In the young of both males and females there is an extremely shallow but distinct cloaca, which is no longer distinguishable in the mature animal.

There is nearly complete representation of both the male and female reproductive tracts which persists in the adults of both sexes. The paramesonephric ducts of the female differentiate into ostium, oviduct, shell gland, and uterus regions. Each uterus is connected to the exterior by a vaginal segment of urogenital sinus origin.

The shell gland develops first as a series of transverse folds on the dorsal and ventral walls of the paramesonephric ducts. Later, outgrowths arise from the grooves between the folds and develop into the branched glandular tubules; these differentiate into albumen, mucous, and shell-secreting types. Some tubules have two distinct regions, each producing a characteristic secretion.

A gland accessory to the genital system (ventral to the vaginae) and functional only in the adult female, is present also in the male, but as a vestige. It is developed from the forward wall of the urogenital sinus and it secretes a white gelatinous body molded to the shape of the gland lumen.

No hemopoietic tissue could be distinguished in either the gonads or in any other portion of the urogenital systems of either sex. Ciliate protozoan inhabitants of the urinary sinuses and ducts in Hydrolagus are provisionally assigned to the genus Trichodina.

Microfilm $2.75; Xerox $5.00. 100 pages.

THE ULTRASTRUCTURE OF THE HUMAN SUBMAXILLARY GLAND

(Order No. Mic 61-2900)

Bernard Tandler, Ph.D.
Cornell University Medical College, 1961

The ultrastructure of normal human submaxillary glands has been studied with the electron microscope. The bases of the secretory cells display complex specializations. The basal membrane is thrown into numerous, slender (650A wide) folds, into which no cytoplasmic organelles penetrate. The basal folds are continuous across the entire cell base, and extend beyond the cell boundary as a series of radiating foot processes. Foot processes of adjacent cells interdigitate loosely. The laciniate configuration of the cell base has been calculated to increase the surface area at least 60 fold. The increase in surface area facilitates diffusion of materials into the cell.

Numerous tubular secretory capillaries course between adjacent secretory cells to open into the acinar lumen. These capillaries possess a great number of microvilli. Secretory capillaries of a finer caliber are separated from the basal folds by only one or two terminal bars, a distance of less than 0.4μ. This arrangement provides a pathway for fluids and other materials to gain rapid access to the acinar lumen from the extracellular space.

The base of serous cells is occupied by an extensive and highly organized rough-surfaced endoplasmic reticulum. The juxtanuclear Golgi apparatus is very large, measuring up to 12μ in length. Four types of secretory granules, which may represent a series of maturing secretory products, have been identified in these cells.

The Golgi material of the mucous cells is distributed in batonettes. The earliest morphologically distinguishable mucous granules are enmeshed in the Golgi apparatus.

Stellate myoepithelial cells are situated between basement membrane and secretory cells. They are identified as contractile elements not only because they possess myofilaments, but also because of the presence of "attachment devices" and numerous pinocytotic vesicles, features which are characteristic of smooth muscle cells. Desmosomal connections between myoepithelium and overlying secretory cells provide topographical stability during contraction.

Nerve terminals are always found in the same location in the secretory acini. They are situated between a secretory and a myoepithelial cell, and among the basal folds.

Large mucoid-appearing granules are present in the apex of intercalated duct cells, suggesting a secretory function for the duct cells.

The so-called infolded basal membranes of the striated duct, long thought to be intracellular, are actually intercellular, as shown by the presence of numerous desmosomes. The desmosomes are similar to those described in other epithelia, but a further substructure of Odland's attachment plaques has been resolved. Numerous vertically oriented, filamentous mitochondria, in combination with the basal plasma membranes, produce the basal rodding. The intercellular basal membranes are complexly folded, resulting in a great increase in the surface area of the membranes. The association of these two structures suggests that the cells of the striated duct may be involved in two distinct modalities of transport — one active, requiring ATP, which is supplied by the mitochondria, and the other simple diffusion, which is enhanced by the greatly expanded membrane.

Occasionally, a complexly folded plasma membrane may be inflected into the cytoplasm. Such inflections always end blindly. The direction of the inflection is sometimes continued in the cytoplasm by a chain of vesicles. These vesicles apparently are formed by comminution of the inflected membrane. Chains of vesicles, not in relation to blindly ending inflections, are frequently found among the complexly folded plasma membranes. It is thought that these vesicles are engaged in pinocytotic activity.

The apical cytoplasm of the striated epithelium abounds with small granules. Masses of apical cytoplasm are liberated into the duct lumen during what appears to be true apocrine secretion.

Microfilm $2.75; Xerox $9.70. 211 pages.

ARCHEOLOGICAL INVESTIGATIONS INTO THE PREHISTORY OF ST. LAWRENCE ISLAND, ALASKA.

(Order No. 61-3480)

Robert Edwin Ackerman, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Froelich Rainey

The prehistory of the Bering Strait region, though carefully studied, still requires further investigation before an archeological continuum can be established. The Paleo-Eskimo and Neo-Eskimo culture sequences established in the 1930's and 1940's require considerable clarification for an understanding of culture contact between contemporaneous cultures, and culture change through time. American and Soviet archeologists on either side of the Bering Strait are trying, through their research, to add new stages to the sequence or to clarify those that exist. The work of Levin and others on the Chukchee Peninsula in 1957 shed new light on the Okvik and Old Bering Sea stages of Eskimo prehistory.

St. Lawrence Island, Alaska, lying 39 miles off the coast of Siberia, although partially investigated in the 1930's, still offered new insights into Siberian archeology. The possibility of finding sites similar to those that were being excavated by the Soviet archeologists was considered. Upon evaluation St. Lawrence Island appeared to offer several potential site areas and was selected as a research area. An archeological survey under the auspices of the University Museum, University of Pennsylvania was then established to (1) investigate the unexplored (archeologically) southern shoreline of St. Lawrence Island for sites of the Okvik and Old Bering Sea stages, (2) seek older Paleo-Eskimo sites along abandoned beach lines, and (3) obtain additional data to clarify the later stages of the Neo-Eskimo culture sequence. Field work was carried out with the help of two Eskimo assistants from June 14 to August 25, 1958. The survey of the southern shoreline failed to reveal any new Okvik or Old Bering Sea sites. Only sites of a later stage (Punuk) were found. Our efforts to locate traces of Paleo-Eskimo sites were also unsuccessful. There was no indication of a Paleo-Eskimo occupation of St. Lawrence Island. Several sites of the Punuk stage were discovered along the eastern, northern, and southern shores of the island. Two sites, Camp Kolowiyi and S'keliyuk have materially contributed to our knowledge of the Early Punuk stage on St. Lawrence Island. The latter site, S'keliyuk, contained Birnirk type harpoon heads in association with Early Punuk types. The Birnirk type harpoon heads were additionally decorated with Early Punuk style designs. The contemporaneity of the two stages is thus clearly shown. A detailed analysis of the artifactual inventory of this site revealed that the Eskimos of St. Lawrence Island during the Early Punuk period received elements from the culture represented by sites of the Birnirk stage on the American mainland, but that this cultural contact had not been forceful enough to establish a distinct Birnirk stage in the prehistory of St. Lawrence Island. The Early Punuk stage on St. Lawrence Island is then a Punuk base with an admixture of Birnirk derived traits.

The St. Lawrence Island archeological survey has accomplished the exploration of the southern shoreline which previously represented an unknown territory. Sites of the Paleo-Eskimo culture and those of the Okvik and Old Bering Sea stages of the Neo-Eskimo culture were not located in this area. Investigation of the eastern, northern, and southern shorelines uncovered later sites which upon analysis have clarified the position of the Birnirk stage during the Early Punuk period of St. Lawrence Island.

Microfilm $4.50; Xerox $15.75. 349 pages.

THE VARIATION IN PHYSICAL TYPES OF THE PREHISTORIC PLAINS INDIANS

(Order No. 61-3485)

William Marvin Bass III, Ph.D.
University of Pennsylvania, 1961

Supervisor: Wilton Marion Krogman, Ph.D.

The 197 adult male skeletons forming the sample used in this dissertation come from the states of Nebraska and South Dakota, in the northern Plains area of the United States.

NAME	ARCHAEOLOGICAL LEVEL	TIME PERIOD
Central Plains	Prehistoric	1200-1400 A.D.
Arikara	Protohistoric	1600-1750 A.D.
Pawnee	Historic	1750-1850

The purpose of this study is:

1. To present for the first time an adequate series of measurements and observations on adult male skeletons of two putative Caddoan Plains Indian Groups: historic Pawnee and protohistoric Arikara; and on a prehistoric Central Plains group.
2. To apply a statistical formula of a modified "Generalized Distance" to the above cultural groups to determine the extent of the morphological differences.
3. To compare the data from these three cultural groups with the data Neumann used for his Lakotid classification (his earlier Prairid Variety) of American Indian racial types.

Standard anthropometric measurements, indices and observations are presented for the material. Eleven

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morphological measurements: head length; head breadth; basion-bregma height; minimum frontal breadth; bizygomatic breadth; bigonial breadth; upper facial height; nasal height; nasal breadth; gonion-gnathion (length of the horizontal ramus of the mandible); and basion-porion height were selected for a statistical analysis to calculate the quantitative measure of morphological differences between the groups under consideration.

The statistical analysis of the adult male individuals reveals that the individuals from the protohistoric Sully, 39ST1, and 39ST216 sites are closely related. The smallest calculated morphological difference occurred between Sully and a combined statistical sample of 39ST1/39ST216 suggesting a very close morphological relationship and supporting the archaeological hypothesis that these were members of the same general population.

A sample composed of skeletal material from four separate cemeteries near Mobridge, South Dakota (one a documented Arikara site) was found to be a heterogenous sample. Comparison with this sample indicated that it may be morphologically related to the Sully and 39ST1/39ST216 samples. The morphological difference was so slight that if the Mobridge sample is historic Arikara, then on the basis of cranial morphology the Sully and 39ST1/39ST216 samples may be considered protohistoric Arikara.

Comparison of the morphological traits of the human skeletal material of Pawnee and Arikara adult male samples was made and revealed that morphologically the Pawnee are more different from the Arikara than are two Arikara groups themselves. These differences, however, are not too great to exclude a relationship between the Pawnee and Arikara. In the over-all statistical analysis it is felt that morphologically the Pawnee resemble fairly closely the Arikara and that there seems to have been enough time since the Arikara and Pawnee separated for slight characteristic morphological differences to occur.

A statistical comparison was made with a prehistoric Central Plains sample which is only remotely, if at all, related to the Arikara and Pawnee. This comparison resulted in a high relative morphological difference indicating that the groups are not closely associated. The relative value of the morphological difference between the Central Plains and Sully, 39ST1/39ST216, Mobridge and Pawnee samples were not all of the same magnitude. A suggested cause of this inconsistency is a highly heterogenous Central Plains sample which is composed of 43 individuals from eight archaeological sites, some of which lack cultural identification.

A comparison of the five skeletal samples under consideration with a classification system of the American Indian set forth by Georg K. Neumann reveals that neither the Pawnee nor the Arikara are as close to Neumann's Lakotid variety as they are to his Deneid variety. Although the differences are not as great as occur between unrelated or more remotely related varieties, it suggests that Neumann's Lakotid variety does not adequately represent the populations of the Plains area except for the Sioux upon which his Lakotid sample was based. The prehistoric Central Plains male was morphologically a much different individual from either the average Lakotid or Deneid male.

It is demonstrated that for the five groups under consideration there is a decrease in mean basion-bregma height through time. The higher basion-bregma heights occur in the prehistoric Central Plains sample and the lowest in the historic Pawnee. Thus, it seems that the relative lowness of the cranial vault is a rather recent trend in the Plains area.

Microfilm $2.75; Xerox $7.60. 162 pages.

AN ANALYSIS OF SOCIAL NETWORKS AS FACTORS INFLUENCING THE HOSPITALIZATION OF MENTAL PATIENTS

(Order No. 61-3883)

Muriel Hammer, Ph.D.
Columbia University, 1961

The concept of a social network is utilized to develop a model for the operation of small socio-cultural systems. Considering a social unit to be composed of persons in linked positions defined by culturally codified behavior, some basic structural variables of a social unit are identified. A social unit is a social network, and is also contained within a larger social network. The general proposition investigated is that a social unit is constrained by the sanctions implicit in its internal and external interactions from changing its form, and that under conditions where the form cannot be maintained unchanged, that change will occur which involves the smallest immediate alteration. Relative magnitude of alternative kinds of changes is discussed. The structural variables treated are (1) narrowness of definition of relevant behavior, (2) distance between positions in a social unit, (3) degree of interconnectedness among positions, and (4) disparity of codifications among interacting persons.

An attempt is made to apply the model to some data on the hospitalization of mental patients. A study is made of the impact of the behavior of the mental patient on the structure of the social units in which he participates, and of the ways in which the characteristics of these structures may be expected to determine the responses made to his behavior. The sample studied consists of Negro and Jewish psychotic patients primarily from one New York City hospital. Primary attention is given to the most intimate unit of which the patient is a member, usually a nuclear family. Several hypotheses regarding speed of hospitalization, agent responsible for hospitalization of the patient, and social responses other than hospitalization are considered as functions of differences in the structures of social units and of the patients' positions in their units. These hypotheses are tested on both the Negro and the Jewish groups, since they are expected to hold independently of subcultural differences. It is found for both groups that hospitalization occurs sooner for patients in narrowly-defined positions; that responses involving structural change in the unit are more likely to occur if ties with the patient are close; and that severance of ties with the patient is less likely to occur if ties are interconnected.

In addition, the Negro subculture is considered to be more deviant than the Jewish subculture from the dominant code, and the effects of disparity of codification on symptom patterns and on frequency and duration of hospitalization are analyzed. Comparison of the Negro and Jewish groups indicates that hospitalization is more frequent, of shorter duration, and for more overt symptoms for a group whose norms are further from the dominant code.

The hospitalization of mental patients is considered as a specific social action which is part of a process of reorganization and recodification in response to pressure for change. It is suggested that such processes must always be occurring in any on-going socio-cultural group. The more general implications of the study are discussed in terms of the relationship between large-scale cultural processes and such small-scale changes as those specifically investigated, the relationship between continuity and change of form, and the relationship between social and cultural systems.

Microfilm $2.75; Xerox $9.00. 197 pages.

ARCHAEOLOGICAL IMPLICATIONS ON THE ROLE OF SALT AS AN ELEMENT OF CULTURAL DIFFUSION

(Order No. 61-3122)

Richard Orville Keslin, Ph.D.
The University of Wisconsin, 1961

Supervisor: Associate Professor Chester Chard

The object of the research was to demonstrate cultural diffusion which had taken place at the prehistoric level and an evaluation of causative factors. The specific concern was to determine the importance of the role salt may have played in cultural diffusion within the central Mississippi Valley. Salt has been used by many peoples over such an extensive time period that we are inclined to take it very much for granted and questions regarding its need, functions, and historical development are rarely considered. Attempts to gain insight on the mechanisms of cultural diffusion in Prehistoric North America by analysis of salt utilization and its possible function as a medium of exchange had not been undertaken previously. Basically the approach was to learn whether or not salt was used, if so, whether its use was due to culturally initiated habituation or to physiological necessity, and to learn everything possible about its functions within the cultural milieu of Middle Mississippi peoples: where it was obtained; the methods which had been devised to obtain it; whether it was the job of men or of women to produce it; whether its use brought about changes in other cultural aspects, such as, residence patterns and specific items of material culture.

Methods for the resolution of these problems involved library research, particularly for human physiology, and for salt utilization by North American Indians during the early historic and ethnographic periods. While literary resources were also used in analysis of the prehistoric situation, primary reliance was placed on data derived from the excavation of a number of archaeological sites adjacent to saline springs within a single river basin in east-central Missouri. Reports of the excavation of these sites is presented to illustrate the cultural sequence and verify salt utilization in prehistoric times.

The research has indicated that salt was not only in common use by a number of prehistoric and historic peoples of aboriginal North America, but was also an item of trade during the early historic period and undoubtedly during at least part of the prehistoric period as well. Available evidence suggests that utilization of salt, obtained by the process of evaporating water from saline springs, may have begun in the central Mississippi Valley as early as 400 A.D. and continued up into historic times. While the evidence is not absolutely conclusive, there is every probability that salt was used because of physiological need brought about by a shift in diet from one based primarily on meat obtained by hunting with some gathering of vegetal foods to one made up primarily of domesticated vegetal foods. The foods composing the latter diet would not provide the requisite amount of salt necessary to normal physiological functions. With regard to cultural practices in manufacturing salt, historic and ethnographic accounts, corroborated by archaeological data, indicate that permanent residence was usually not maintained at the salt source. Instead, the Indians made a trip to the source of salt whenever a supply was needed. The autochthonous division of labor had women doing most, if not all, of the work connected with salt manufacture. Ethnographic accounts indicate that inter-group trading activities were conducted by men and this was probably true in the prehistoric period as well, but conclusive archaeological evidence corroborating this fact has not been found.

Microfilm $4.00; Xerox $13.95. 309 pages.

A RORSCHACH COMPARISON OF ADULT MALE PERSONALITY IN BIG COVE, CHEROKEE, NORTH CAROLINA, AND "HENRY'S BRANCH", KENTUCKY.

(Order No. 61-3530)

Rudolph Paul Kutsche, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: A. Irving Hallowell

Problem: This project examined the proposition that Indians and Whites living in the Southern Appalachian Highlands had lost their separate psychological identities. The prediction was made that if Rorschach and background cultural data were compared for a community on the Qualla Reservation of the Eastern Band of the Cherokee, and for a White community similar in environment, the two communities would appear virtually identical. The author also desired to add to the body of projective material on Eastern Woodlands Indians, and to collect material on isolated Whites.

Methods: To test the hypothesis, field work was done first on Big Cove, supposedly the most conservative of the Eastern Cherokee townships. A random sample of 50 of the 120 adult males (i.e., 18 and over) was selected and given the Rorschach test (no refusals). The Porteus Maze test was also employed, but with a convenience rather than random sample. Participant observation field work was undertaken during the summers of 1956, 1957, and 1958, and the autumn and winter of 1957. The author worked as part of a University of North Carolina field team in Big Cove. Similar field work was conducted by the author alone in a pseudonymous neighborhood ("Henry's Branch") in the Cumberland Plateau in southeastern Kentucky. Twenty-three of the 25 adult males were given the Rorschach

test, the others refusing. Participant observation field work was undertaken here during the summers of 1957 and 1958, and the autumn and early winter of 1957.

In both neighborhoods as much non-psychological data as possible was collected, in the usual categories of history, habitat, technology, economy, politics, kinship structure, religion, and life cycle. This material, presented under these categories, forms the cultural background for the psychological data.

Rorschach material is handled in three ways: analysis by arithmetic mean for the two samples and for the Spiegel Mail Order House in Chicago, comparisons by t table between each of the three pairs; analysis by median; separate analysis of eight Big Cove and four Henry's Branch subjects. Structural-functional analysis is attempted, to integrate psychological and non-psychological aspects of culture.

Results: The hypothesis of psychological identity is disproved, since in four out of 28 Rorschach scoring categories, Big Cove and Henry's Branch show differences which are significant at the .05 level of confidence or better. However, the two Appalachian samples are more similar to each other than either is to the Spiegel sample. Big Cove has 10 categories out of 22 significantly different from Spiegel; Henry's Branch has 16 categories out of 22 significantly different from Spiegel. Big Cove, consequently, is closer to Spiegel. Differences and similarities other than Rorschach are discussed. Cherokee psychological data is in general similar to that from other Eastern Woodlands Indians.

Conclusions: The study concludes that in each society the psychological data is congruent with the non-psychological. Since no more than four Rorschach indices out of 28 are significantly different between the Appalachian samples, environment (i.e., habitat plus culture) has apparently had a great influence on psychological structure. But the Rorschach test is not felt to be a powerful instrument of discrimination between samples when response totals are small.

Microfilm $7.90; Xerox $28.15. 621 pages.

FACTIONALISM AT ONEIDA, AN IROQUOIS INDIAN COMMUNITY.

(Order No. 61-3546)

Alex Frank Ricciardelli, Ph.D.
University of Pennsylvania, 1961

Supervisor: Anthony F. C. Wallace

This study is concerned with the origin and development of factionalism in an Oneida Indian community during the period 1900 to 1960. Located near Muncey, Ontario, on the Thames River, the community was established in 1840 by three hundred and sixty Oneida Indians who had migrated from their original homeland in New York State. The population of the community numbered about fifteen hundred in 1956.

Field work was conducted over a period of one year, beginning in 1956. Data was obtained through extensive interviews, participant observation, and the examination of documentary material. After the field work was completed, private communications with informants provided details on many local events as recent as 1960.

This analysis focuses mainly on the political system and the strains within it which contribute to the rise of factionalism, with the role of leaders examined in detail. For the purpose of this study factionalism is defined as groups in conflict over the control of the government and seeking to permanently suppress the opposition. Factions are distinguished from political parties in that they are not legitimate internal opposition groups; they are not institutionalized in the sense of opposing one another at expected and periodic intervals.

In the Oneida political system there existed hereditary chiefly positions, organized into a hereditary chiefs' council, involving long tenure but little directive authority. These had mainly integrative functions, such as the settlement of internal disputes. At the same time there were provisions for selecting individuals to occupy positions which had directive authority, involving the organization and leadership of large-scale activities. These directive leaders were selected at meetings attended by the entire community and empowered to act for the community on important issues. Tenure in these positions was for limited periods only and subject to constant review. It was found that a strain was created whenever a leader attempted to assume directive authority over a long-term period.

Extended directive authority was not freely granted by the Oneida. (Those who were exceptional orators were most successful in occupying such positions.) Furthermore, the assumption of long-term directive authority was challenged by others seeking to obtain leadership roles in the community. Various pressures caused the encumbent leader to seek the elimination of criticism and effective opposition. This was achieved by blocking the opponents' access to governmental groups and positions. The organization of an opposition group by the frustrated leaders resulted in the rise of factionalism.

The existence of major crises of long duration was found to be crucial in the rise of factionalism. In one case the crisis involved the growing pressure of white influence on the community. This gave rise to two groups, Christian and Longhouse, with different interests and reactions to this influence. Leaders of these groups competed with one another in order to gain control of the major decision-making and administrative processes in the community and thus enhance the positions of their respective groups. In another case a factional split occurred within the Christian group as a result of conflict over long-range policy among the leaders. In each case a developing oligarchy and a disruption of the traditional governmental system was involved.

It is suggested that the processes described apply to the Oneida of the historical period and the Northeast culture area in general, where similar patterns of political organization existed.

Microfilm $3.85; Xerox $13.50. 298 pages.

A THEORETICAL STUDY OF BLENDS OF PAIRS OF METALLIC LINES IN THE SOLAR SPECTRUM

(Order No. 61-4435)

Choko Fujita, Ph.D.
Indiana University, 1961

Blends are usually neglected in abundance determinations using curves of growth because of difficulties associated with determining the equivalent widths of the individual lines. Our method has the advantage of using profiles rather than equivalent widths. By studying the profile of a blend it is also easy to investigate the effects of different assumptions concerning the model atmosphere simultaneously on two lines formed at different depths.

Several blends of pairs of metallic lines in the solar spectrum were studied. Lines were assumed to be formed by pure absorption and in thermodynamic equilibrium, and the effects of ionization, excitation, collisional damping, and the distribution of micro-turbulence in the model atmosphere were taken into account. The theory and the procedure for computing the profile of a two-line blend are similar to those for a single line profile, except that the ratio of line absorption coefficient to continuous absorption coefficient is replaced by the sum of the two ratios and some complication is involved in calculating an entire blended profile.

Lines for study were selected from the Utrecht Photometric Atlas of the Solar Spectrum and were corrected for instrumental broadening by Bracewell's method. The computations were carried out on an IBM 650. About 45 seconds are required to compute the residual intensity at one point in a blended profile. There are three free parameters in the computations, once an initial continuum model is chosen: The abundance factor, the constant in the damping formula, and the model of micro-turbulence. The central intensity was adjusted by varying the abundance factor; the other two were determined by fitting a theoretically computed profile to an observed profile. It was necessary to increase the constant in the damping formula to fit the computed wings, which were generally narrower than the observed wings. An attempt was made to find a model of isotropic micro-turbulence which would be adequate for all lines considered. The model of turbulence finally adopted increases with depth from 1.3 km/sec at $\log \tau_{5000} = -2$ to 3.2 km/sec at $\log \tau_{5000} = 0$.

A detailed description of the program is included in an Appendix. The set of IBM cards of the program is available. Microfilm $2.75; Xerox $4.00. 73 pages.

AN OBSERVATIONAL STUDY OF CONVECTION IN THE SOLAR ATMOSPHERE

(Order No. 61-4473)

Edward Cooper Olson, Ph.D.
Indiana University, 1961

I. Statement of the Problem

Observational evidence for both velocity and temperature inhomogeneities in the solar photosphere, indicating some type of convective motion, is well known. An attempt is made in this work to study the asymmetry run of several solar lines (the shifts of the line center with residual line intensity), making comparisons between numerical calculations with schematic convective models and observations made at the McMath-Hulbert Observatory of the University of Michigan.

II. Procedure

a. Theoretical Convective Models

The convective elements which have the greatest effect in producing line asymmetries are those which have 'overshot' into the convectively stable region of the photosphere. It is possible to calculate approximately the temperature changes in such elements as they rise or fall by considering the radiation exchange with the surroundings. The complex physical situation is replaced by a column model in which overheated columns of material rise and cooled columns fall. The constancy of mass transport is required at each level of the atmosphere. The associated convective velocities can be estimated from simple hydrodynamic resistance.

The final calculated profile consists of the average of the Doppler shifted profiles from the two types of columns. Because of the higher excitation, the rising column contributes a stronger profile; the run of asymmetry results from the combination of the two components. The actual calculations were carried out with the IBM 650 computer of the Research Computing Center of Indiana University.

b. Line Profile Observations

The following lines were chosen on the basis of freedom from blends:

Fe I λ 5929.7 A
Fe I λ 5930.2 A
FeII λ 5991. A
O I λ 7774. A

The line profiles were obtained with the vacuum spectrograph from the average of five or six photoelectric tracings with a ratio recorder technique at a dispersion of about six inches per Angstrom on the chart paper. Observations were made over the solar disk at $\mu = \cos\theta = 0.9$, 0.6, 0.4, positions closer to the limb being questionable

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due to poor seeing conditions. The runs of asymmetry were checked from microdensitometer tracings of spectrograms and found to agree with those obtained photoelectrically to within 1.0 mA. over most of the line. The question of instrumentally induced asymmetry was checked both observationally (using telluric lines) and numerically (using the actual instrumental profile) and found to be negligible.

III. Results

Several convective velocity and temperature column models were integrated. The neutral iron lines were fairly insensitive to the model differences; agreement was obtained between observed and computed asymmetry runs within the observational errors. The FeII line showed good agreement near the solar limb, but the discrepancy increased strongly toward the center of the disk in the sense that a red shift seemed to be present in the observations over most of the residual intensity range in the line. This matter requires further investigation.

The infrared oxygen line, exhibiting a larger asymmetry than the other lines, gave good agreement with observations, but with somewhat different distributions of convective velocity and temperature in the columns. The convective velocities were smaller and the temperature inhomogeneity located somewhat deeper in optical depth than in the case of the neutral iron lines.

IV. Conclusions

Since the oxygen line is formed more deeply and over a greater path length than are the neutral iron lines, the convective effects in the former are due to larger elements. In this range of the turbulent spectrum (element size about 200 to 300 km.), the element velocity probably decreases with increasing element size; hence, the above result is not surprising. The greater depth of the temperature inhomogeneity for the oxygen line may reflect the fact that the larger elements decay as they rise in the photosphere, reducing the effect on the oxygen lines sooner than on the iron lines. Microfilm $2.75; Xerox $4.00. 71 pages.

BACTERIOLOGY

A STUDY OF THE COMPARATIVE CYTOLOGY OF SOME MEMBERS OF THE GENUS NOCARDIA

(Order No. 61-3830)

James Norman Adams, Ph.D.
University of Georgia, 1961

Supervisor: Norvel M. McClung

A comparison was made between members of the genus Nocardia with simple growth cycles and those with more complex cycles of development. Cell walls, chromatinic bodies, lipid inclusions and metachromatic granules of representative organisms were investigated by experimentally selected cytological means throughout the developmental periods.

Nocardia rubra, an organism considered to be in the intermediate range of complexity of development in the genus, was found to develope in the following manner: Coccoid, ovoid and rod shaped cells, containing single chromatinic bodies, observed in old cultures were found to germinate when placed on fresh medium. During the period of germination, the chromatinic body divided and one of the resultant bodies migrated into the developing germ tube. The chromatinic body which migrated into the germ tube divided and the products of this division subsequently divided as the filamentous germ tube continued to elongate. When germ tubes reached filament lengths, branches were produced thus producing mycelium. The branches were similar to the filaments in all respects and were produced randomly along the length of the filaments.

The chromatinic bodies contained in the filaments and branches were not synchronous in their division and apparently divided amitotically.

After a suitable period of incubation, the filaments fragmented at sites of septum formation at irregular intervals in the filaments. Septum formation increased with, and as a consequence of, culture age thus producing shorter filaments. The final period in the cycle was marked by septum formation and separation of the short filaments which resulted in the production of cells like those found in the original inocula.

Metachromatic granules, which have been previously mistaken for nuclei and chromatinic bodies, were present in all stages of development of N. rubra. The metachromatic granules were extremely basophilic, were removed by hydrolytic periods of 2 to 10 minutes in 1 N HCl at 60° C, were not removed by ribonuclease or deoxyribonuclease and were presumably composed of a metaphosphate. These metachromatic inclusions were found to be separate entities which were easily differentiated from lipid, cell wall and chromatinic structures. They varied considerably in size and were more or less regularly distributed throughout the filament length. Such findings suggest that these granules may originate from a deposition of waste materials at sites within the cytoplasm.

Lipid inclusions were generally distributed in the cytoplasm throughout the lengths of the cells, but the inclusions were frequently localized at the internal boundary of the cell walls. The locations and relative abundance of these inclusions did not significantly differ throughout the growth cycle of the organism.

Results of electron microscope studies of whole and sectioned cells of N. rubra essentially supported those obtained with the light microscope.

Comparable studies with Jensenia canicruria, Nocardia erythropolis and Nocardia asteroides were carried out. These studies indicated identical cytological events for these organisms when compared to N. rubra, but they differed in duration and complexity of filament production

during the periods of the developmental cycle. The organisms listed in increasing degree of complexity of development are as follows: J. canicruria, N. erythropolis, N. rubra and N. asteroides.

Microfilm $2.75; Xerox $7.00. 146 pages.

THE INHIBITORY EFFECT OF CERTAIN COMBINATIONS OF ANTIMETABOLITES AND OTHER COMPOUNDS ON THE DEVELOPMENT OF INFLUENZA VIRUS

(Order No. 61-3914)

James Milton Bowen, Ph.D.
Oregon State University, 1961

Major Professor: K. S. Pilcher

Selected combinations of antimetabolites and other compounds have been shown to exert synergistic effects on the inhibition of virus development in chick embryo chorioallantoic membrane tissue cultures infected with Lee influenza virus. Preliminary tissue culture tests with 16 pairs of virus inhibitors revealed that 3 pairs, L-canavanine plus benzimidazole, L-canavanine plus DL-β-phenylserine, and DL-β-phenylserine plus benzimidazole, were synergistic in their inhibitory effects. Selected pairs of inhibitors involving L-canavanine, benzimidazole, DL-β-phenylserine, DL-p-fluorophenylalanine, DL-m-tyrosine, and ribonuclease also showed synergistic effects on virus inhibition in tissue culture. Addition of a third component to certain inhibitor pairs resulted in further enhancement of the inhibitory effects on virus development in tissue culture, as did addition of a fourth component to certain three component mixtures. The experimental results suggested that the synergistic effects observed with the mixtures might be due to simultaneous interference with two or more reactions necessary for synthesis of virus protein.

Certain inhibitor combinations were shown to possess increased selectivity of antiviral action compared with the individual inhibitors. The selectivity of antiviral action was expressed by the ratio of the concentration causing suppression of growth of chorioallantoic membrane cells to that causing significant inhibition of virus development. Highest selectivity ratios were observed with two pairs, L-canavanine plus DL-p-fluorophenylalanine and DL-p-fluorophenylalanine plus ribonuclease. Selectivity ratios for individual inhibitors varied from 2 to 32, with the majority being in the range of 2 to 8. Selectivity ratios for selected three and four component mixtures were in a range of 16 to 64. The results of the selectivity ratio comparisons indicated that the use of combined inhibitors, in tissue culture at least, enhanced the property of effective antiviral activity at concentrations far removed from those toxic to the host.

Maximum tolerated doses of L-canavanine, benzimidazole, DL-β-phenylserine, DL-m-tyrosine, DL-p-fluorophenylalanine, or ribonuclease failed to significantly influence virus development in the lungs of Lee virus infected mice. Selected pairs and three component mixtures were also inactive against virus infections in mice. A mixture of L-canavanine, benzimidazole, DL-β-phenylserine, and DL-m-tyrosine significantly reduced virus content and extent of pulmonary consolidation in lungs of infected mice compared with non-treated controls. Dosages of the mixture effective against virus development appeared toxic to the mice. There was a distinct lack of parallelism between virus inhibition and suppression of pneumonia by the mixture. Marked reductions in pulmonary consolidation were observed at a dose of the mixture below that significantly inhibitory for virus development in the lungs. Pulmonary consolidation was also observed in lungs of mice receiving intranasal instillations of saline without virus. The source of this pneumonia was inapparent. Its origin did not appear to be bacterial.

Selected five component mixtures significantly inhibited virus development in lungs of Lee influenza virus infected mice. Results obtained with a mixture of L-canavanine, benzimidazole, DL-β-phenylserine, DL-m-tyrosine, and DL-p-fluorophenylalanine indicated that, while it was effective in reducing virus content in the lungs of treated mice, and relatively non-toxic, it appeared to be less effective in suppressing pneumonia than the four component mixture without DL-p-fluorophenylalanine.

It appeared from the results of mouse studies that use of combined inhibitors enhanced the inhibitory activity of the individual components sufficiently to cause significant inhibition of virus development in lungs of infected mice; however, the extreme doses of the mixtures required to significantly influence virus development made them appear of little value in practical chemotherapy. These findings are nevertheless interesting because compounds capable of producing such effects in virus infected animals are extremely rare and because of the suggested mechanisms of action of these antimetabolite mixtures.

Microfilm $2.75; Xerox $7.60. 165 pages.

PHYSIOLOGICAL STUDIES ON RADIATION RESISTANT BACTERIA OCCURRING IN FOOD

(Order No. 61-3921)

Dennis Edward Duggan, Ph.D.
Oregon State University, 1961

Major Professor: Arthur W. Anderson

Spoiled samples of radiation "sterilized" ground beef were found to contain large numbers of non-sporing forms of bacteria, which were subsequently shown to be remarkably resistant to radiation. These organisms are described and classified and their resistance to gamma radiation, to ultraviolet light and to heat are characterized.

Three cultures of a micrococcus and one of a rod culture were described. All four cultures were non-motile, non-sporing, non-encapsulated, aerobic Gram-positive organisms forming pink to red colonies. The cocci were typically found in tetrads, while the rods appeared as single cells or in chains. The morphology, cultural characteristics, biochemical reactions, and physiological characteristics of the organisms were described. The cultures did not closely resemble previously described species. The names proposed were: for the coccus, Micrococcus radiodurans Anderson Nov. Spec. and for the rod, Brevibacterium oregonium Anderson Nov. Spec.

Raw pureed meat substrates were developed that could be pipetted for quantitative bacteriological studies. Using these methods, gamma radiation survival curves were determined in raw beef using four strains of Micrococcus radiodurans and one culture of Brevibacterium oregonium. The rod culture was as resistant as the most resistant strain of the coccus cultures. Survival curves in raw and cooked beef, in raw chicken, raw fish and in buffer were determined. The effects of growth medium and of initial cell concentration were investigated. All cultures exhibited segmoidal survival curves in all menstrua used. Terms were developed to describe the survival curves under various experimental conditions. The most resistant cultures were reduced in number by a factor of about 10^{-5} by 3.0 megarad, 10^{-9} by 4.0 megarad, and 10^{-12} by 4.7 megarad. Higher menstruum temperatures during radiation and preirradiation heat treatments both lowered resistance to irradiation. Irradiation in a frozen menstruum offered only slight protection. The effects on resistance of various modifying factors in a buffer substrate were described. Ascorbate seemed to greatly enhance radiation destruction.

The gamma-resistant micrococcus was shown to be more resistant to UVL than other non-sporing bacteria or spores of Bacillus globigii. Some similarities and differences in response to UVL and to gamma radiation were pointed out. The effects on resistance to UVL of various menstruum factors were described. Photoreactivation was not demonstrated.

The thermal resistance of the most gamma resistant coccus culture was characterized by Decimal-reduction-time (D values) and z-values. Thermal death, unlike radiation inactivation, seemed to approximate an exponential rate. A D_{140} = 0.75 and z = 10.65 described the heat resistance in beef.

Microfilm $2.75; Xerox $8.60. 187 pages.

A CYTOCHEMICAL EVALUATION OF A METHOD FOR THE ISOLATION OF THE NUCLEAR MATERIAL FROM BACILLUS MEGATERIUM

(Order No. 61-3504)

Patrick Echlin, Ph.D.
University of Pennsylvania, 1961

Supervisor: Edward D. De Lamater, M.D.,

Many reports have been published on the morphology and cytochemistry of the nucleus in bacteria, while very few attempts have been made, either to isolate the intact nuclear material or to characterize its structure. Such investigations have been seriously hampered by a lack of adequate techniques for both the controlled disruption of the bacterium, and the separation and characterization of the components liberated from the disrupted cells.

An analysis has been made of a method which permits the isolation of intact nuclear material from Bacillus megaterium.

Cells grown in a salts-glucose medium and subsequently in casein hydrolysate with added growth factors, were treated with a 1% sodium glycocholate solution in isotonic phosphate buffer pH 7.4. A cytologic and chemical analysis was made of the changes observed. It was found that cells treated with the bile salt were more susceptible to disruption by high-frequency sound waves.

By means of filtration, differential centrifugation and enzymatic digestion, it was possible to obtain intact nuclear material relatively free of any cytoplasmic and cell wall contamination.

During the glycocholate treatment, there was a continued loss of protein, peptides, amino-acids and amino-sugars, ribonucleic acid and derivatives, lipids, acid soluble carbohydrates and UV absorbing material. There was also a decrease in the turbidity of the cell suspension, and a loss in the dry weight of the cells. No loss of deoxyribonucleic acid was observed, neither was there a decrease in the cell count. A cytologic examination of the cells revealed a progressive loss in cytoplasmic density, while the nuclear structures remained dense. Such nuclear structures could be stained by both the Feulgen and Azure A SO_2 methods.

Thirty to sixty seconds exposure to high-frequency sound waves was sufficient to disrupt a large proportion of the cells, releasing the cytoplasmic and nuclear contents. There was a loss of protein, peptides, amino-acids and amino-sugars, ribose and deocyribose nucleic acids and derivatives, acid soluble carbohydrates and UV absorbing material. The cell count, dry weight and turbidity also decreased during exposure to the high-frequency sound waves. Extended exposure was found to break up the nuclear material, causing a solubilization of the constituents, necessitating careful monitoring of the whole process.

Chemical analysis of the isolated nuclear material revealed the presence of deoxyribonucleic acid, ribonucleic acid, and a protein fraction containing basic amino-acids and sulfhydryl groups. The protein fraction of the nuclear material was thought to be made up of a basic protein and a fibrous structural protein. The isolated nuclear material could be stained by the Feulgen and Azure A SO_2 methods, and by a stain specific for sulfhydryl containing proteins. The stained structures and the isolated material as observed under the phase-contrast microscope, closely resembled the structures seen in intact and glycocholate treated cells.

The isolation procedure, and the correlative chemical studies, confirm that it is possible to isolate intact nuclear material from Bacillus megaterium.

Neither the surface activity of the glycocholate or the concept of autolysis, adequately explained the observed effect of the bile salt on the organism. The evidence suggested rather that the glycocholate was having a more selective action on the cells, leaving the nuclear material essentially intact.

A concept of chemical dissection has been proposed by which controlled chemical reactions at specific sites, permits a more accurate analysis of the structural relationships of cells. Microfilm $2.75; Xerox $3.80. 70 pages.

A STUDY OF THE MECHANISM OF NITRIFICATION BY ASPERGILLUS FLAVUS

(Order No. 61-4866)

Kevin Charles Marshall, Ph.D.
Cornell University, 1961

Aspergillus flavus produces both nitrite and nitrate in media containing peptone, amino acids or ammonium as sole nitrogen sources, the oxidized products being formed towards the end of the growth cycle. The delayed appearance of the oxidized compounds may be associated with cellular lysis. It is considered unlikely that the energy derived from the oxidation is of any importance in the growth and metabolism of the fungus.

The oxidative sequence in heterotrophic nitrification has been considered in relation to that proposed for the autotrophic bacteria. Bound hydroxylamine has been detected in actively nitrifying cultures of the fungus growing at a neutral pH while free hydroxylamine was found in cultures at a low pH where nitrite and nitrate were not produced. Cell extracts of A. flavus did not oxidize ammonium or the nitrogen of a number of amino acids but were found to catalyze the production of nitrite from β-nitropropionic acid. The enzyme involved in this reaction is present in the soluble fraction of the cell extract, it is heat labile and it apparently is specific for β-nitropropionate. Some indirect evidence for the oxidation of nitrite to nitrate was presented. Cultures of A. flavus grown on an ammonium medium appear to lack a nitrate reductase system.

Three hypothetical pathways of nitrification in A. flavus were discussed: (a) the oxidation of the amino group of β-alanine to yield β-nitropropionate with the subsequent production of nitrite and nitrate; (b) a similar pathway from aspartic acid involving a decarboxylation to yield the β-nitropropionic acid; and (c) the oxidation of ammonium to hydroxylamine which could react with an aldehyde to yield an oxime, the oxime-N being oxidized via β-nitropropionate to nitrite and nitrate.

Since the fungus possesses a peroxidase-like enzyme, the possibility of the peroxidase being functional in the nitrification process has been considered.

A. flavus does not produce nitrite or nitrate in a medium that has been purified of trace metals by being autoclaved with alumina. Bound hydroxylamine, however, was detected in these cultures. The effect of the alumina has been reversed by the addition of cerium (10^{-3} M), but it is not certain that this element is truly functional in the nitrification system.

It has been demonstrated that A. flavus is able to oxidize the sulfur in cysteine to sulfate. The evidence presented indicates that the mechanism involved in sulfate formation is probably independent, at least in part, of that in the oxidation of nitrogenous compounds.

Microfilm $2.75; Xerox $4.60. 86 pages.

AN IMMUNOLOGICAL COMPARISON OF ANIMAL-GROWN AND BROTH-GROWN SHIGELLA FLEXNERI TYPES 1b AND 3

(Order No. 61-3398)

John Tyler Miller, Ph.D.
Boston University Graduate School, 1961

Major Professor: E. E. Baker

It has been observed by many investigators that most persons seemed to possess an increased resistance to bacillary dysentery following recovery from this disease. However, shigella vaccines made from in vitro-grown organisms did not increase resistance to dysentery. The purpose of the present investigation was to determine whether or not Shigella flexneri produced antigens in the in vivo environment not formed by culture-grown organisms which might explain resistance to reinfection.

Immunological comparison of animal- and broth-grown Shigella flexneri types 1b and 3 involved comparing agglutination reactions of animal- and broth-grown organisms and comparing their antigenic structures by means of the agar-diffusion precipitin technique. Antisera were prepared in rabbits by immunization with either acetone-killed broth-grown organisms or viable organisms grown intra-abdominally in mice for three serial passages without culture. Antisera were absorbed with broth-grown Shigella flexneri of various types. Animal-grown Shigella flexneri were prepared by inoculating mice and guinea pigs with organisms suspended in neutralized sterile 5 per cent mucin solution. The organisms were recovered by injecting intra-abdominally 0.15 M sodium chloride and aspirating the organisms with a needle and syringe. The resulting organisms were identified both serologically and culturally. Guinea pig-grown organisms were used for test antigens, whereas the mouse-grown organisms were used only for antiserum production in order to eliminate the possibility of reactions between normal guinea pig protein and antibody to mouse proteins. Saline solutions of water extracts of acetone-dried organisms were employed for the agar-diffusion precipitin studies.

Type 3 Shigella flexneri grown for one, two or three serial passages in either mice or guinea pigs were compared among themselves and with broth-grown type 3 organisms by their agglutination reactions with antisera prepared to either mouse-grown or broth-grown organisms. No difference was detected either between the passage materials themselves or between the passage material and the broth-grown organisms.

The antibodies present in the antisera and, therefore, the antigens present in the type 3 organisms used to prepare the antisera were determined by their agglutination reactions with Shigella flexneri types 1a, 1b, 2b, 4b, X and Y. Unabsorbed antisera and antisera which had been absorbed with Shigella flexneri types 1a, 1b, 4b and X were used. From the results it was evident that antisera prepared to either mouse- or broth-grown type 3 organisms contained the same antibodies.

The precipitin pattern in agar-diffusion plates formed by broth-grown type 3 Shigella flexneri and its antiserum was found to have three zones. Of the two zones formed nearest the antigen well, one was identified as being due to the type specific III antigen, and the other due to an antigen probably specific to type 3. The third precipitin zone represented

the group antigens, since the precipitin zones formed by the cross-reacting Shigella flexneri types merged with this third zone.

A four zone precipitin pattern was formed by the reaction of antiserum prepared to mouse-grown type 3 Shigella flexneri and water extracts of either guinea pig- or broth-grown organisms. The zone formed nearest the antigen well was due to the type specific III antigen and the second zone was due to another antigen, probably specific to type 3. The third zone represented the 3, 4 and 6 group antigens, since it merged with a zone formed by type 1b. The fourth zone represented the 1, 7 and 8 group antigens, since it also was merged with the zone formed by type 1b. This zone was removed completely by absorption of the antisera with type 1b. From these results it was concluded that the precipitin patterns of broth- and animal-grown type 3 Shigella flexneri represented the same antigen-antibody systems.

Broth-grown and animal-grown type 1b Shigella flexneri were compared the same way as the type 3 organisms, with similar results. From the results obtained with type 1b or type 3 Shigella flexneri, it was concluded that these organisms did not produce any antigens in the in vivo environment that were not present in the broth-grown homologous organisms. The conclusions were discussed in relation to the known antigenic structure of the Shigella flexneri. The results were also discussed in relation to human resistance to bacillary dysentery.

Microfilm $2.75; Xerox $6.60. 140 pages.

BIOCHEMICAL AND PHYSICAL FACTORS INFLUENCING MICROBIAL DENITRIFICATION REACTIONS

(Order No. 61-3937)

Pedro Dante Roa, Ph.D.
Oregon State University, 1961

Major Professor: C. M. Gilmore

The problem of soil nitrogen losses has been studied by scientists for a considerable period of time. These workers observed that certain soil microorganisms may carry out the required chemical reactions via the stepwise oxidation of organic carbon coupled with the reduction of nitrate-nitrogen to nitrogen and nitrous oxide. Studies using soil and pure cultures have contributed to the understanding of the problem of denitrification; however, conflicting results have left the field open to conjecture. The reason lay in the lack of a suitable technique. Gas chromatography for the study of denitrification was a major contribution to the present investigation. Since the approach required an atmosphere devoid of nitrogen, an introducing device, a respiration flask and flushing technique were developed. In conjunction with an electrolytic respirometer, a set-up for aerobic denitrification studies was also devised. This method allowed for qualitative and quantitative measurements of unknown gas mixtures from previously obtained calibration curves.

Initial studies on the extent of nitrogen losses with five different western soils indicated considerable variation, particularly when wheat straw was added to the test soils. Soil studies made abundantly clear that the approach should center on denitrifying cultures rather than on a mixed soil population. Consequently denitrifying cultures 8, 9, 11 and 16 were isolated. Culture growth on trypticase broth at known nitrate-nitrogen levels indicated culture specificity in regard to the types of nitrogenous gases produced. With cultures 11 and 16 the evolution of nitrous oxide and nitrogen was observed, but no depletion of nitrous oxide into nitrogen with time occurred; the role of nitrous oxide as an intermediate was thus discarded with these organisms.

The evaluation of the role of specific nutrients was made with a semi-synthetic medium in conjunction with quartz-sand which provided a system resembling soil environmental conditions. Yeast extract effects centered on nitrate reduction to gas and not on the rate of carbon oxidation. At the lower yeast extract level (20 mg) nitrite-nitrogen accumulated and a rather low amount of nitrogen was produced; whereas at the higher levels, no nitrite-nitrogen was detected but proportional increases in nitrogen occurred. From the above it was deduced that an unknown cofactor essential for reduction activity is provided by the yeast extract. Asparagine was found to cause a delaying effect on glucose utilization, thereby exerting a specific influence on the nitrate reduction. Variable denitrification effects were obtained with different carbon sources. With culture 9, key intermediates of the citric acid cycle were capable of being utilized as oxidants for the denitrification process. Some evidence had accumulated that carbon dioxide fixation might play a role in providing four carbon moieties for terminal oxidation of the added oxidant. Different carbon dioxide tensions in the flask atmosphere resulted in non-significant evolution of nitrogen, but the final greater recovery of carbon dioxide with the higher tension of carbon dioxide indicated that fixation was contributing to the oxidation of the carbon source.

A final point relates to the controversial question of "aerobic denitrification." For this purpose a sand which provided active oxygen diffusion was used and the electrolytic respirometer-gas chromatography technique was employed. No nitrogen evolution was detected during the period of active oxygen uptake, nor was reduction of nitrate-nitrogen complete until a low partial pressure of oxygen was attained. The oxygen effect appeared to center on the further reduction of nitrite-nitrogen to the gaseous state. Thus the term "aerobic denitrification" does not appear justified and certainly should be re-evaluated in the light of the present investigation.

Microfilm $2.75; Xerox $5.60. 111 pages.

THE MECHANISM OF ANTIGEN-ANTIBODY REACTIONS

(Order No. 61-3603)

John Price Robinson, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Victor A. Najjar

Evidence is presented in this paper lending strong support to the concept of antigen-antibody reactions proposed by Najjar and Fisher in 1955. According to this proposal, there should be in a positive immune serum two measurable types of antibody – 1) antibody directed against the antigen used in immunization and 2) antibodies against antigen-antibody complexes of varying degrees of saturation with antibody. Due to the numerous demonstrations of the first type of antibody, only the latter type is dealt with here. There should be two types of anticomplex antibodies, one type being directed against the antigen portion and another against the antibody moiety of the complex. There could also be anticomplex antibodies against the adjoining surfaces of the two components of the complex. However, no such antibodies have been demonstrated and consequently, will not be discussed here. Due to the limitations of present day immunological techniques, the anticomplex antibodies which lend themselves most readily to investigation are those against the antibody portion of the complex.

The existence of antibodies specifically directed against antigen-antibody complexes within the individual have neither been suspected nor investigated until recent years. However, the existence of such antibodies and indeed their specificity for the complex used to produce them have now been demonstrated. Sera secured from immunized rabbits that showed sufficient antibody response were termed positive and from similar rabbits after failing to show a measurable titer were termed negative. Sera obtained from nonimmunized rabbits were labeled normal sera.

All three types were fractionated individually by electrophoresis-convection. The eight resulting fractions, with isoelectric points at pH values of 7.5, 7.0, 6.5, 6.0, 5.5, 5.0, 4.5 and one fraction containing proteins which were isoelectric below 4.5, were subjected to electrophoretic and ultracentrifugal analysis. The higher isoelectric fractions contained essentially gamma globulin and showed only one peak corresponding to 7S globulin in the ultracentrifuge. All fractions which are isoelectric below pH 6.5 are multicomponent by both analyses.

In the isoelectric fractions of positive immune sera, a clear separation of the anticomplex antibodies from antibodies against the antigen was obtained. The former antibodies were located in fractions isoelectric between pH 6.0 and 4.5 while the latter were primarily located in fractions isoelectric between pH 6.0 and 7.5. The anticomplex antibodies were demonstrable with two methods – 1) their ability to react with rabbit antibody attached to sheep red blood cells thereby causing agglutination of the cells – 2) their ability to react with antigen-antibody complexes. The results also indicate that they react actually with the antibody moiety of the complex. Antibodies to antigen were demonstrated by precipitation with antigen.

Anticomplex antibodies appear to be present in all sera whether immune or normal. The specificity of such antibodies was demonstrated by absorption of positive immune serum with specific autologous and nonspecific homologous complexes. This was followed by measuring the degree to which the ability of the serum to cause agglutination of sheep cells sensitized with rabbit antibody was lowered. The results demonstrated clearly that specific complex removes more anticomplex antibody than can be absorbed by nonspecific complex as judged by the greater diminution of the agglutinating titer against sensitized sheep cells.

The addition of a high concentration of anticomplex or antiglobulin antibodies to a rabbit antigen-antibody precipitating system inhibits the rate of complex formation while addition of a low concentration of these antibodies to the same system will enhance the rate of precipitate formation. This is what would be expected if the antibodies to the antibody moiety of complex can associate with the free antibody to antigen before it enters the complex. Thus, even though such an association were very weak, if enough anticomplex antibodies are present, there would be inhibition of the rate at which the complex is formed. Such inhibition and enhancement was demonstrated with low isoelectric fractions of immune and normal sera.

L-arginine, and to a lesser extent lysine, inhibit the rate of reaction between BSA-anti-BSA or ovalbumin-antiovalbumin precipitating systems at some stage or stages prior to the attainment of the equivalence state. The inhibition appears to be due to the association of arginine with the antibodies which react early in complex formation. The activity of antibodies which react with equivalence complex is not inhibited by arginine and thus demonstrates a difference between anticomplex antibodies and antibodies involved early in complex formation. The negatively charged and neutral amino acids show no inhibition.

On the whole precipitating system, there is a similar inhibitory effect by arginyl-leucine, arginyl-aspartic, arginyl-glutamic and arginyl-alanine while no inhibition is produced by alanyl-alanine, glycyl-glycine, threonyl-glycine, seryl-serine or glutamyl-alanine. The possible inhibition by dipeptides on the anticomplex-complex system was not investigated.

Microfilm $2.75; Xerox $4.00. 72 pages.

THE INTRACELLULAR FATE OF STAPHYLOCOCCI

(Order No. 61-3552)

Mehdi Gholamalizadeh Shayegani, Ph.D.
University of Pennsylvania, 1961

Supervisor: Frank A. Kapral

The intracellular behavior of staphylococci was studied within monocytes and polymorphonuclear leucocytes of rabbits as well as human blood leucocytes.

Since conflicting results had been previously reported, an attempt was made to follow the intracellular fate of this organism with different quantitative tissue culture methods. These methods consisted of studying infected leucocytes 1 – Adhered to cover slips in special plastic chambers. 2 – Maintained suspended in the medium. 3 – Adhering in very low concentrations on Petri dishes. 4 – By direct phase microscopy.

These methods were devised to focus attention on the survival of the staphylococci at different intervals subsequent to phagocytosis. The intervals selected were the period immediately after phagocytosis, the interval between 2 to 18 hours, and the period extending to about 3 days.

It was found that the leucocytes were able to phagocytize S. aureus 18-Z and S. albus in the presence of "normal" rabbit serum. In the case of S. aureus Smith which resists phagocytosis in normal rabbit serum because of its capsule, immune serum was necessary to obtain phagocytosis unless the organisms were packed together with the leucocytes by means of centrifugation.

Since in many of these experiments streptomycin was incorporated in the tissue culture medium to suppress the extracellular multiplication of staphylococci, there was a possibility that this antibiotic might penetrate into the leucocytes and interfere with the intracellular survival. Different indirect approaches indicated that in the concentrations employed interference by the drug was not a problem. It was observed that the intracellular organisms behaved the same in the absence of streptomycin if the extracellular organisms were repeatedly washed away, or if streptomycin dependent or adenine requiring mutants were used. Furthermore, high concentrations of streptomycin or preincubation of the leucocytes in the antibiotic did not effect the intracellular behavior of the organism.

The results obtained with the four methods were in agreement with each other. It was found that S. aureus (18-Z or Smith strains) usually survived within monocytes and polymorphonuclear leucocytes of "normal" rabbits, and within blood leucocytes of "normal" humans for several hours without multiplication, but were eventually destroyed. No extensive immediate destruction of this organism could be demonstrated. However, there was variation in the intracellular behavior within leucocytes of different rabbits in that cells from some donors began to show a slow destruction of the staphylococci shortly after phagocytosis. In contrast, S. albus were rapidly destroyed within all leucocytes.

Microfilm $2.75; Xerox $4.00. 71 pages.

BIOLOGY-GENETICS

VARIABILITY OF MORPHOLOGICAL AND CHEMICAL QUALITY CHARACTERISTICS IN FLOWERS OF MALE HOPS, HUMULUS LUPULUS L.

(Order No. 61-3915)

Stanley Nelson Brooks, Ph.D.
Oregon State University, 1961

Major Professor: J. Ritchie Cowan

Investigations involving 20 male hop lines were undertaken in 1956 which were designed to measure variability in several characters, particularly those concerned with quality components important in cones of the female. The data obtained from this trial in 1958 and 1959 were used to calculate estimates of genotypic, phenotypic and environmental variability for these characters. Inter-relationships of characters were studied by means of path coefficient analysis.

Wide differences among lines were shown for alpha-, beta-, and total hop-acid, resin gland number and volume, flower weight, and date of flowering. Estimates of diversity indicated that most of the variability for all characters was due to genotypic differences. Expected gains from selection calculated on the basis of single plant observations indicated that alpha-acid, beta-acid and total hop-acid would be essentially doubled by selecting the upper five per cent of the population. For number of resin glands, an increase of 65 per cent of the mean would be expected on the same basis. Expected gains from selection for size of resin glands, weight of flowers, and date of flowering were much less, but the data suggested that significant gains would be obtained.

Alpha- and beta-acid contents were directly associated with total hop-acid content and with each other. Both alpha-acid and beta-acid, and in turn total hop-acid, were directly influenced by resin gland number, whereby an increase in resin gland number increased the chemical components. This was true for both the genotypic and environmental effects. An increase in resin gland size brought about an increase in beta-acid content through its genotypic effect but not through its environmental effect. Gland size appeared to have no effect on alpha-acid content. An increase in flower weight tended to increase both beta-acid and alpha-acid through its environmental effect but tended to reduce beta-acid content through its genotypic effect. It appeared that lines possessing genes for late flowering were inherently low in alpha-acid and beta-acid, but environmental conditions associated with late flowering tended to increase alpha-acid content. Similarly, the association of high resin gland number with late flowering also tended to increase hop-acid content. The path coefficient analyses of the effects of gland number, gland volume, flower weight, and date of flowering on hop-acid components were fairly rigid for the phenotypic associations, but both genotypic and environmental effects were only partially accounted for.

The results reported in this study are important to the hop breeder and illustrate the amount of variability present and thus the expected gain from selection for several characters. Among these were factors of hop quality which, until recently, have been measured only in female plants.

Microfilm $2.75; Xerox $4.20. 76 pages.

THE EFFECTS OF DEUTERIUM OXIDE ON BACTERIA

(Order No. 61-3426)

Rosalie Frances De Giovanni, Ph.D.
Columbia University, 1961

The incorporation of deuterium into bacterial cells induced phenotypic and genotypic changes. Growth in D_2O-media was inhibited, there was an increase in the lag period, an increase in the generation time and a diminished final cell count. Several bacterial strains were studied and the degree of growth inhibition was strain specific. No strain was inhibited below concentrations of 50% D_2O and no one strain grew as well as controls in media containing concentrations of 70% to 99.5% D_2O. The mixture of deuterium (in a high proportion) and hydrogen atoms probably gave rise to unsynchronized metabolic reactions in the cell that led to altered growth patterns. An over-all isotope effect might have resulted from the differences between the reaction rates of the hydrogen and deuterium atoms. The addition of 0.5% NaCl (w/v) to D_2O-media, decreased the inhibition of growth. No strain adapted to better growth in deuterium containing media; however, a spontaneous deuterium-resistant mutant was obtained from one strain. Two strains formed enlarged, distorted cells when grown for more than eight generations in D_2O-medium. Cells grown in D_2O-medium, washed and resuspended in H_2O-0.85% NaCl (w/v) were up to sixty times more sensitive than controls, on a survival basis, to ultraviolet irradiation. For some strains, a high concentration of deuterium in the cell induced the occurrence of forward mutations. Many loci, but not all, showed an increase in the back-mutation rate over the spontaneous level, indicating some specificity of the mutagenic action of deuterium. The factor of increase over the spontaneous back-mutation rate ranged from 1.78 to 54.2. Deuterated bases were obtained from the highly polymerized DNA of a strain grown in D_2O-medium. The nitrogenous bases containing the higher amounts of deuterium were thymine and cytosine. None of the deuterated bases induced any phenotypic or genotypic effects when supplied to specific base-requiring strains. Apparently the effects induced by high concentrations of deuterium in the cell are not due solely to nitrogenous bases containing the isotope in stable positions. The total amount of deuterium incorporated into cells that had undergone four divisions in D_2O-medium was one half that of cells that had undergone eight divisions; the later showed an increase in the back-mutation rate over the spontaneous level but the former did not. The amount of deuterium incorporation may be related to the mutagenic affect induced by deuterium. In addition, the mutagenic action of deuterium may be due to an interference of synthetic pathways concerned with DNA replication or to the distortion, by the mixture of hydrogen and deuterium bonding, of the DNA molecule. All may induce errors at DNA replication time that could lead to mutant induction.

Microfilm $2.75; Xerox $3.00. 48 pages.

THE BIOLOGY OF A COLONIAL HYDROID

(Order No. Mic 61-1844)

Chandler Montgomery Fulton, Ph.D.
The Rockefeller Institute, 1960

Simple invertebrate metazoa offer many potentialities for study of growth and differentiation – potentialities which have not been realized because the organisms usually have been difficult to handle in the laboratory. A simple coelenterate, the brackish-water colonial hydroid Cordylophora lacustris, was selected for the present work, and was domesticated so that it could be grown and manipulated under controlled laboratory conditions. Methods have been developed permitting exponential increase in hydranth number with a doubling time of about three days. Five ions – Na^+, K^+, Ca^{++}, Mg^{++}, Cl^- – have been found to be required for growth in the defined aqueous environment, and other variables influencing growth rate have been systematically studied. The colonies are fed daily with living larvae of the brine shrimp, Artemia.

The control of the feeding reaction has been studied. It has been found that, as in Hydra (Loomis, 1955), a single molecular species released from captured prey induces the feeding reaction. The active compound has been isolated from Artemia extract and identified as the imino acid proline, and reagent proline has been found to induce the feeding reaction at 10^{-5} molar. Magnesium, and possibly phosphate ions, have been shown to influence the response to proline. Perhaps the most interesting aspect of this discovery is from the point of view of comparative biochemistry and evolution, for previous workers have found that the feeding reactions of three other Hydrozoa are controlled by reduced glutathione.

Time-lapse cinematography of the colonies has revealed proximally-oriented peristaltic waves which apparently act to circulate nutrients through the colonies. These waves are rhythmic, and occur about once every twenty-five minutes in resting colonies. After feeding, the frequency of the waves increases to one every eight minutes, and falls back to the resting rate over the course of several hours. The most striking feature of the peristalsis is that it is synchronized throughout a colony, in that the waves begin at the tip of each hydranth simultaneously. The time-lapse movies have also elucidated a series of rhythmic movements which occur during the reconstitution of hydranths from tissue fragments.

The major emphasis of the study has been an attempt to gain an understanding of the asexual development of a Cordylophora colony. While at first glance a colony appears to be a forest of little trees, on closer examination one finds that a colony may be considered a series of tubes of uniform diameter. The shape of a colony may be considered to result from the (1) relative rates of growth, (2) spacing, and (3) angles of these tubes. A descriptive study of the development of shape under one set of culture conditions has been made. On the basis of the three parameters, three types of tubes may be distinguished: stolon tubes, upright tubes, and branch tubes. These tubes were all found to grow at constant, but different rates. This linear growth of tubes posed a paradox, since the number of hydranths in a colony had been found to increase exponentially. It was shown that the dry weight of a colony also increases exponentially, and a model was developed

permitting the resolution of linear growth of parts into exponential growth of the whole. Study of the development of individual colonies using a marking technique showed that the development of shape in these colonies proceeded essentially as predicted by the model.

Microfilm $2.75; Xerox $8.00. 171 pages.

PART I. TISSUE CULTURE OF DROSOPHILA. PART II. PTERIDINES AND EYE PIGMENTATION IN DROSOPHILA MELANOGASTER.

(Order No. 61-4695)

Edward William Hanly, III, Ph.D.
The University of Texas, 1961

Supervisor: Robert P. Wagner

Tissue Culture of Drosophila: Several approaches have been taken in attempts to establish permanent cultures of Drosophila melanogaster tissues in vitro. The source of the tissues and the artificial environment have been the two major variables investigated.

Several media, originally prepared by other investigators, were adapted to Drosophila culture technique by adding various supplements. A medium used by Grace for the culture of Lepidoptera tissues was found to be the most suitable. Its osmotic pressure was examined and found to be optimum at the chemical concentrations quoted. The pH optimum for Drosophila tissues seems to be between 6.2 and 6.5. Tissue extracts of the flies were tested as supplements to Grace's medium. An embryo extract at a 5% concentration supported Drosophila cells for longer periods of time and in better conditions than did any other. No other supplements tested, tissue extracts or known chemicals, stimulated growth or mitosis.

Several cycles of mitosis were observed in explants made either from early embryos or from third instar larval brains. Cells were maintained in a viable state for over two months and then discarded because no mitosis had occurred. Permanent cultures of Drosophila tissues have not been obtained.

Some further problems of insect tissue culture were discussed.

Pteridines and Eye Pigmentation in Drosophila melanogaster: By culturing Drosophila melanogaster eyes removed during various stages of pupal development, a "point of no return" was found for wild-type pigment deposition. The process of pigmentation in vitro was inhibited by Malpighian tubules from older pupae and various pteridines, and was stimulated by testes from older pupae and other pteridines. A possible sequence of events leading to normal eye pigmentation is discussed in light of these findings.

Enzyme preparations were made from wild-type and several mutant flies and pteridine metabolism was studied. Several differences between the mutants, maroon-like (ma-1) and rosy-2 (ry^2) were found. Enzyme preparations from both were incapable of oxidation of several purine and pteridine substrates (hypoxanthine, xanthine, 2-amino-4-hydroxypteridine, 2,4-dihydroxypteridine, etc.), although wild-type preparations could carry out these conversions. All of these reactions required diphosphopyridine nucleotide (DPN) as a cofactor. However, ma-1 preparations were incapable of producing an unidentified compound from pyridoxal hydrochloride, of converting 4-hydroxy- into 2, 4-dihydroxypteridine, of "fast melanin production," and of producing an increase in 340 mμ absorbing substances, whereas ry^2 and wild-type preparations contain all these activities. None of these latter reactions require exogenous cofactors.

Two interpretations of these data are considered. One assigns the roles of xanthine dehydrogenase production to ry^+ and a cofactor production to ma-1^+. The second interpretation assumes that both mutations affect a single enzyme which has two active sites, each with different origins, functions and substrate affinities. Both theories are considered in the light of the above-mentioned data as well as the data accumulated by other investigators concerning a "cross-reacting material" present in the flies and the maternal effect present in ma-1, but not ry^2, progeny.

A discussion is included concerning the unusual production of hypoxanthine and xanthine from endogenous sources when uric acid is added to mutant enzyme preparations. Microfilm $2.75; Xerox $6.20. 128 pages.

STUDIES ON MUTANT STRAINS OF PNEUMOCOCCUS LACKING THE ENZYME AMYLOMALTASE AND ON THE APPEARANCE OF THE ENZYME SUBSEQUENT TO GENETIC TRANSFORMATION

(Order No. Mic 61-1847)

Sanford A. Lacks, Ph.D.
The Rockefeller Institute, 1960

A wild strain of Pneumococcus was found to contain an enzyme, amylomaltase, which enabled the cells to utilize maltose by converting it to glucose and oligosaccharides. Several properties of this enzyme were investigated.

Eight mutant strains unable to utilize maltose were derived from the wild strain and were found to be devoid of amylomaltase activity. These strains were subjected to genetic analysis by means of DNA-mediated transformation.

Transformation of the different mutant strains to maltose utilization by wild-type DNA occurred with different frequencies. Each maltose-negative strain thus exhibited a characteristic tendency toward restoration by the transforming DNA.

Recombination of the genetic material of the negative strains was examined by transforming one mutant strain with DNA from another. In certain cases the interaction gave rise to maltose-utilizing cells. An analysis of the frequencies of recombination indicated that the regions of genetic material where the alterations occurred in the different mutations were not identical, but that they were linked and arranged in a linear fashion. Certain of the mutations appeared to have involved alterations of regions of greater extent than others.

Inasmuch as the genetic analysis employed purified DNA, the pattern found for the genetic factors responsible

for the presence of amylomaltase must reflect the actual distribution of determinants within a DNA molecule.

When isolated wild-type DNA was heated before being used to transform the mutant strains, it was found that its genetic activity with respect to the factors corresponding to the larger genetic regions was inactivated more rapidly than its activity with respect to the factors corresponding to smaller regions. There was a direct correlation between the size of the genetic region corresponding to a factor and its sensitivity to heat. Furthermore, under the conditions of heating employed, the genetic activity of a DNA molecule appeared to be impaired without being totally destroyed.

All the mutant strains investigated exhibited the peculiar property of being very strongly inhibited by maltose from growing on certain sugars, such as glucose, but not on others, such as sucrose. The causes of this phenomenon and its relationship to the amylomaltase deficiency have not been ascertained.

Another unusual feature of certain of the mutant strains, of those three in which larger alterations in the genetic material were detected, was the absence of another enzyme, a phosphorylase, capable of phosphorolyzing starch. This enzyme was shown to be distinct from the amylomaltase. It would appear, therefore, that in these cases mutation of a single gene affected two different enzymes.

When the appearance of amylomaltase was followed in transformed cultures of negative strains, it was found that the enzyme was formed without appreciable delay. As early as ten minutes after the DNA treatment, and thereafter, the enzyme was produced as a constant fraction of the total protein synthesized.

Furthermore, examination of amylomaltase synthesis after transformation in mutant strains showing different frequencies of transformation to maltose utilization revealed that the rate of enzyme production was proportional to the extent of permanent transformation. Since the same amount of DNA was taken up by the cells in the different cases, it appears that the DNA must be genetically integrated, in permanent fashion, before giving rise to enzyme formation. Microfilm $2.75; Xerox $4.80. 94 pages.

THE EFFECTS OF GROWTH SUBSTANCES ON ATTACHED AND DETACHED ROOT TIPS OF PISUM SATIVUM L

(Order No. Mic 61-1578)

Georgia Evangeline Manos, Ph.D.
Fordham University, 1961

Mentors: Dr. Richard M. Klein and
Professor Charles A. Berger, S. J.

Attached and detached pea roots were cultured in a medium (Torrey 1959) supplemented with IAA, GA and Kn, used singly and in combination. Reactivation of attached roots treated with IAA as described by Bürström (1953, 1957) was confirmed. There was no reactivation of detached roots. The total number of cells in detached and attached roots were unaffected by the auxin treatment.

Attached and detached roots treated with Kn were inhibited at higher concentrations, but unaffected at lower concentrations. However, the growth of detached roots was suppressed by the fifth day. Attached roots exhibited fewer cell numbers and detached roots showed no change in cell numbers with Kn treatment.

High concentrations of GA applied to attached roots suppressed growth, but suppression was not manifested until the fourth day at lower concentrations. Cell numbers were also reduced except at the lowest concentration when a reduction was not evident until the fourth day. GA at high concentrations inhibited the growth of detached roots; lower concentrations were ineffective. Cell numbers were unaffected by treatment with GA.

Attached roots treated with mixtures of IAA + Kn and IAA + GA exhibited a reactivation of growth after an initial inhibition. The roots reacted as if they were treated with Kn alone. Cell numbers were unchanged in roots treated with IAA + Kn. However, roots treated with IAA + GA showed a reduction of cells by the fourth day. Detached roots showed a reactivation of growth with no change in cell numbers until an increase occurred in the later days.

The GA + KN treated attached roots reacted as if treated with GA alone. There was no effect on growth until the fourth day when growth was suppressed. Cell numbers were fewer relative to the control. Detached roots were unaffected until day 6 when a slight increase occurred. The cell numbers of detached roots showed no difference relative to the control.

Mixtures of all three (IAA, GA and Kn) caused an inhibition of growth and decreased number of cells in attached roots. The detached roots showed a reactivation after an initial depression, but cell numbers showed no change relative to the control.

Detached and attached pea root tips showed decided variations in their reactions to treatment by the growth substances. However, the effect of IAA on roots was mainly on cell elongation and not cell division. Whereas Kn inhibits cell production in attached roots, in detached roots this inhibition is inoperative. GA also decreased cell production in attached roots but not in detached roots.

Attached and detached roots, when tested with IAA plus one other growth substance, react only to the cell elongation capacity of IAA. The GA + Kn treated attached roots react as if treated with GA alone. However, the detached roots are unaffected by treatment with GA + Kn until day 6 when a slight increase occurred. The numbers of cells showed no difference relative to the control.

The mixtures of all three produced a reduction of cell numbers, the depression of cell numbers by GA and Kn enhanced the depression of cell elongation by IAA. However, detached roots were able to recover from the depression to a small extent by the sixth day.

Microfilm $2.75; Xerox $5.00. 99 pages.

A LIMNOLOGICAL STUDY OF STONES RIVER, TENNESSEE.

(Order No. 61-3601)

John Gerald Parchment, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor James J. Friauf

This study presents limnological data obtained from the West Fork, East Fork, and Main Channel of Stones River located in central Tennessee. Most of the data presented were collected in field studies of the river from July 30, 1955 to September 30, 1956. The investigation embraces a study of the bottom fauna, plankton, and chemical - physical conditions.

Analysis of the physical data reveals low color values and high transparency values. Water temperature reflects the seasonal decline and rise of air temperature. The maximum turbidity reported is 400 ppm. and fifty per cent of the readings are 30 ppm. or below. Current measurements gave the majority of rates from approximately one to two feet per second. Water level and flow records, furnished by the U. S. Corps of Engineers, reveal that the rate of flow in the West Fork is usually about one half of the rate of flow in the East Fork and this difference is correlated with the areas of their drainage basins.

Analysis of chemical data reveals the typical range of dissolved oxygen values to be from 4.8 to 11 ppm. Free carbon dioxide was quite variable in amount, but was usually present. Monocarbonates vary from 0-25 ppm. and appear in only 41% of the samples. Bicarbonates were always considerable but never exceeded 200 ppm. The pH values for the combined stations range from 7.3 to 9.0. Consistent pH values during the year indicate a well-buffered water. Phosphates seldom appear in the samples. Nitrates vary from 0.04 to 2.00 ppm. and are present in all of the samples tested. Nitrites vary from 0.002 to 0.500 ppm. and decrease progressively downstream.

During the period of study the Stones River net-plankton population averages 698.5 individuals per liter. When all of the stations are considered, the Myxophyceae were the most abundant phytoplankters (67.9%) and Rotifera were the most abundant zooplankters (79.2%). The phytoplankton-zooplankton ratio was 6:1 based on the numbers per liter. Based on the areal standard-unit method the phytoplankton-zooplankton ratio changed to 2.5:1. Chemicals in solution, fluctuations in flow, and temperature appear to be the factors involved in plankton production.

During the period of study the Stones River bottom organisms averaged 62 individuals per square foot or 2.28 grams per square foot (200 lbs. per acre). When total collections from all stations are considered, the Mollusca were the most common organisms based on numbers per square foot (85.7%) with Insecta next in the order of abundance (12.5%). When the bottom organisms are compared by weights, Mollusca form 63.2% of the total biomass with the Crustacea second in importance (28.8% of the total biomass). Current rates, rate of flow, and bottom type appear to be the principal factors influencing production of bottom fauna. The total number of bottom organisms is sometimes greater in pools but insects are noticeably more abundant in the riffle areas. Spring has the greatest mean population of bottom organisms and winter the least. These are probably correlated with the seasonal life cycle of insects and fluctuations in gastropod populations.

Microfilm $2.75; Xerox $7.60. 161 pages.

THE DEVELOPMENT OF A NEW BIOCHEMICAL GENETIC TOOL: PODOSPORA ANSERINA NIESSL.

(Order No. 61-3645)

James Edwin Perham, Ph.D.
The Florida State University, 1961

The feasibility of using Podospora anserina Niessl as a biochemical genetic tool was established through studies of the growth requirements, factors influencing fruiting body formation and germination, methods of mutant induction and isolation, and mutant analysis.

Examination of the nutritional requirements for vegetative growth has shown that a growth level suitable for assay determinations can be obtained when the basal salt medium is supplemented with thiamine, glucose, and ammonium acetate.

The time required for initiation of fruiting body formation upon Esser's medium is decreased from 12 days in total darkness to 5 days with a light intensity of 150 foot-candles.

Germination of ascospores is nutritionally dependent; the most effective of all compounds tested was ammonium acetate, which gives a maximum germination of 98%. Nitrogen in the form of nitrate cannot replace the ammonium ion in this function.

X-radiation of ascospores has proven effective for mutant induction. A proportion of ascospores exposed to X-rays germinate on complete medium but do not undergo further development. From germination percentages obtained on both minimal and complete media it has been found that inactivation of germination is exponential.

Of 11 induced mutants 3 were studied in detail. Analysis of a tryptophaneless strain, M-31, has shown it to be "leaky" with varying growth responses as expressed by dry weight when cultured in minimal medium. Homokaryotic stocks of this mutant respond to both indole and tryptophane but not to anthranilic acid.

A calcium sensitive strain, Ca^s, produces abnormal hyphae when the mutant is grown in the presence of high concentrations of calcium. Microscopic examination of stained hyphae demonstrated the presence of sudanophilic globules within the mutant cytoplasm that are not associated with the wild-type strain. It is postulated that the influence of calcium is indirect and that the primary "lesion" is the inability of the mutant to hydrolyze the accumulating lipid product.

A third mutant of the group analyzed, C^{1625}, produces a water soluble incarnadine pigment once active growth was initiated after 10 days of culturing. This pigment acts as an acid-base indicator.

Genetic analysis of the 3 strains showed M-31 and Ca^s to be recessive in character while the C^{1625} strain demonstrated a dominant relationship to the wild-type. The most extensive study of gene dosage was performed with the Ca^s strain in which it was possible to obtain a

polynucleate spore with 80% mutant nuclei and 20% wild-type nuclei. In those cases where the mutant character was recessive, the wild-type expressed itself regardless of the nuclear ratio involved.

Microfilm $2.75; Xerox $6.40. 135 pages.

FUNCTIONS OF SYMBIONTS IN THE FAT BODY OF THE TROPICAL COCKROACH, LEUCOPHAEA MADERAE (FABRICIUS).

(Order No. Mic 61-1579)

Leon Lamont Pierre, Ph.D.
Fordham University, 1961

Mentor: Professor Daniel Ludwig, Ph.D.

The fat bodies of insects have been observed to play a role in their metabolism. Wigglesworth (1942, 1949) showed that this tissue is the site of large deposits of glycogen, fats, proteins, and uric acid. Blochmann (1887), Friedberger (1916 a,b,c), Atkin and Bacot (1917), Sikora (1919), Glaser (1920, 1930), Neukomm (1927), Milovidov (1928), Gier (1936, 1947) and Hoover (1945) pointed to the infestation of this tissue by numerous microorganisms; and Noland, Lilly and Baumann (1949), Blewett and Fraenkel (1944), and Pant and Fraenkel (1950, 1954) observed that the organisms play a metabolic role within the fat body.

This investigation was undertaken to discover the possible role of the symbionts of the cockroach, Leucophaea maderae in the metabolic activities usually attributed to its fat body. It included the isolation and cultivation of the symbionts outside of the fat body, an investigation of their morphological and physiological properties, an attempt to identify them, and finally, an attempt to reintroduce them into the fat bodies of aposymbiotic insects.

Cockroaches used in the experiment were reared in the laboratory, and they consisted of 20 controls, and two experimental groups of 12 each. A diet of Gaines' dog biscuits was fed to the controls; but this diet was powdered and mixed with aureomycin and terramycin and fed to the experimental groups.

Symbionts were isolated from the fat body and cultured on lactose agar. Their morphology and physiology were studied.

Symbiont homogenates incubated with mannose at 30°C. for three hours, and assayed according to the method of Roe and Keuther (1943) synthesized 20 μg. of ascorbic acid per gram of material used. Homogenates made from the adult and nymphal aposymbiotic fat bodies produced corresponding amounts of 4.05 and 3.7 μg. per gram respectively.

Uricase was isolated from the homogenates according to the methods of Holmberg (1939) and Praetorius (1949). The symbiont enzyme extracted by the first method converted 4.8 μg./ml. of uric acid in two hours, and the adult and nymphal aposymbiotic fat bodies enzyme 4.5 and 0.3 μg./ml. respectively. Corresponding values for the enzyme extracted by the second method were 4.05, 5.2, and 1.4 μg./ml. respectively, and the Michaelis' constants for the enzyme activity showed respective values of 1.6×10^{-5}, 2.7×10^{-5}, and 0.7×10^{-5}.

Guanase isolated from the homogenates according to the method of Kalckar (1947b) and assayed by the method of Roush and Norris (1950) or Block and Johnson (1955) deaminated guanine to xanthine, despite the method of assay.

Xanthine oxidase activity was investigated in the homogenates by the Thunberg technique (1920). No activity was encountered in the aposymbiotic fat body homogenates; but those of the symbionts decolorized methylene blue in the presence of various purine compounds.

This investigation has shown that the symbionts of Leucophaea maderae are bacteria which belong to the family Enterobacteriaceae, and may possibly be of the genus Aerobacter.

Microfilm $2.75; Xerox $7.00. 150 pages.

MUTATION AS AN ERROR IN BASE PAIRING (I) (II).

(Order No. 61-3468)

Rivka Rudner, Ph.D.
Columbia University, 1961

The use of highly mutagenic base analogues known to be incorporated into DNA and agents which produce unusual bases in nucleic acid in situ can provide information of the molecular changes that result in mutations. When applied in a comparative manner to a well mapped gene the mutagenic specificity of a given base analogue can be determined. Reversions from auxotrophy to prototrophy in Salmonella typhimurium induced in the presence of the base analogues 5-bromouracil (BU) and its deoxy derivative (BUDR), 2-aminopurine (AP) and nitrous acid have been investigated. Twenty-three mapped mutational sites in the tryptophan -D and -C loci known to block the last step in the biosynthesis of that amino acid were selected for these studies. Fifteen, or 65%, were found to be base analogue inducible; the rest were noninducible. The mutant alleles showed considerable specificity of response to the mutagens; some were highly inducible by AP and only a little by BUDR, while others gave the opposite response and still others responded about equally to both analogues. The increased frequency of prototrophs after growth in the presence of the mutagens was due not to selection of pre-existing mutants as shown by reconstruction experiments. Correlated with these genetic findings, chemical studies reveal that a large amount of BU can be incorporated into the DNA of this organism replacing thymine specifically. A small amount of unaltered AP was recovered from the DNA of a purine-requiring mutant. The amount of AP was too small to determine the actual per cent replacement of individual purine(s). These agents are believed to act as tautomeric mutagens and to bring about the replacement of an adenine-thymine $\left(\frac{A}{T}\right)$ nucleotide pair by a guanine-cytosine $\left(\frac{G}{C}\right)$ pair, or vice versa. During or following the incorporation of the base analogues there is an increased likelihood of error in base pairing. The new stable pair at the mutant site is established only when two replications of DNA succeed the initial incorporation. This model of mutation by transitional change was tested

in populations of Salmonella typhimurium strain tryD-10 and tryD-79 whose division had been synchronized by fractional filtration. Mutations from auxotrophy to prototrophy induced by BUDR and AP occurred in accordance with DNA replication. Two subsequent DNA replications were necessary to obtain BUDR-induced prototrophs in D-79, one subsequent DNA replication was required for AP-induced prototrophs in D-79, while no subsequent DNA replication was necessary for AP-induced prototrophs in D-10. This was observed whether the mutagens were present continuously or during the first replication and also when the cells were allowed to replicate their DNA without cell division in the presence of inhibitory concentrations of the base analogue or when protein synthesis was blocked in the presence of chloramphenicol. Base pair transitions induced by the analogues can occur by two mechanisms: (1) as "errors in incorporation" and (2) as "errors in replication." When the base analogue is present only during one DNA replication the pattern of mutant increase for the first mechanism is n, n, 2n, 4n, etc. and for the second mechanism it is n, 2n, 3n, 5n, etc. A statistical analysis of the pattern of mutant increases was used to distinguish between the two types of errors induced by the base analogues thereby identifying the base pair at the mutant site. It was found that in the case of tryD-10, AP induced "errors in replication," therefore the mutagenic direction of that transition is $\frac{A}{T} \rightarrow \frac{G}{C}$; while in the case of tryD-79, BUDR induced "errors in incorporation," hence the mutagenic direction of that transition is $\frac{G}{C} \rightarrow \frac{A}{T}$.

Microfilm $2.75; Xerox $5.80. 118 pages.

A STUDY OF THE INTERRELATIONSHIPS OF VARIOUS NUTRILITES REQUIRED BY TETRAHYMENA PYRIFORMIS H.

(Order No. Mic 61-2608)

Samuel Singer, Ph.D.
New York University, 1958

Adviser: Dr. Richard P. Hall

A study was undertaken to determine the effect of varying a number of nutrilites required on the defined medium for Tetrahymena pyriformis H, two, three, four and five at a time. A number of interrelationships and imbalances were observed, especially among the amino acids. The experiments were conducted in a defined medium reduced to the absolute nutritional requirements.

The experiments were at first set up with a view to analyzing the resultant data statistically. To this end, use was made of Yates' short cut method which involves Yates' method of accumulation, determining the mean square error, and calculating its significance. When these statistical methods did not prove fruitful a ranking method utilizing the same factorial design as in Yates' method was developed. Titration of the effects discovered in the ranking experiments was accomplished by employing a "latin square" design. Graphs of these latin square experiments, comparing growth vs. the ratio of the growth factors concerned, under various nutritional conditions, proved very useful in studying the dynamics of the nutritional milieu.

The effect, on these phenomena of such inhibitors as the antimethionine, dl-Ethionine; the antifolic, Pyrimethamine; and the antiguanine, 8-azaguanine, was investigated. By limiting the study to some of the growth factors more intimately associated with the folic acid system (serine, methionine, glycine, guanine, threonine, and histidine), a beginning was made in recognizing and studying the dynamics of some of these nutritional interreactions.

A "serine(s)-methionine(M)-threonine(T)-histidine(H)-guanine(G)-folic acid(F)-balance" was uncovered which presumably illustrates a more general amino acid-vitamin-growth factor nutritional balance.

Illustrative of the S-M-T-H-G-F-balance is the serine-methionine (S/M) interreaction. It was first noted in ranking experiments that inhibition of growth of Tetrahymena by increased concentrations of methionine is reversed by increased concentrations of serine. Further study showed the extent of the S/M balance and its influence on and by the other components of the medium.

If methionine was in excess, depression and inhibition of growth was obtained. If serine was in excess, inhibition of growth occurred but to a lesser degree. Growth could be restored if the S/M balance were restored. In addition, there appears to be a methionine + serine (M + S) inhibition due to imbalance, if these two amino acids were imbalanced in terms of the other nutritional components. This was especially evident with low concentration of folic acid.

These imbalances are modified still further by the other components of the medium. Interrelationships involving threonine, histidine, guanine and glycine with serine and methionine were found. In addition, increases in inhibition were discovered between combinations of methionine or serine and threonine, histidine, guanine, glycine and folic acid.

The use of nutritional antagonists supported the concept of a dynamic nutritional milieu. In general, at the concentrations used, the antimetabolites appear to affect the availability of their respective metabolites and, as a consequence, the nutritional conditions obtained are similar to those with low levels of the metabolites.

The phenomena uncovered in the course of the investigation are compared with the work of other investigators. Possible explanations are suggested for the effects observed. The effects observed were examined especially in the light of modern work on the role of amino acid transport across the cell membrane. Certain practical implications of the work are discussed and possible future avenues of investigation are suggested.

Microfilm $2.75; Xerox $5.60. 114 pages.

CHROMATOPHORE DEVELOPMENT, PITS AND OTHER FINE STRUCTURE IN THE RED ALGA, LOMENTARIA BAILEYANA (HARV.) FARLOW.

(Order No. 61-3419)

George Benjamin Bouck, Ph.D.
Columbia University, 1961

Cellular structures of the macroscopic red algae are known mostly from studies with the light microscope. This has proven inadequate for studying certain features of this group of plants, and attempts are here made to utilize the higher resolving powers of the electron microscope in order to supplement the light microscope observations.

Thin sections of the red alga, Lomentaria baileyana (Harv.) Farlow, a tubular member of the Rhodymeniales, were examined after permanganate fixation and Araldite embedding. Attempts were made not only to interpret organelles from a single cell, but to follow successive changes in the development of these organelles from their youngest stages in the apical region up to the more highly differentiated bodies in the cortical and hyphal cells. Whole cells were examined in order to ascertain differences of kinds and quantities of organelles in different regions of the plant. Four principal types of cells were recognized in this study; apical, cortical, hyphal and gland cells.

Many organelles in Lomentaria were found to be similar to analogous structures in higher plants. But of particular interest were the modified areas generally known as pits in the walls between cells which are unique to the members of the higher orders of red algae. These have sometimes been interpreted to be pores between cells allowing communication of adjacent protoplasts, but in this study they were found to consist of a plug-like structure surrounded by an uninterrupted membrane apparently continuous with the plasma membrane. The function of this apparatus is not known, but its consistent appearance between divided cells of the Florideae would seem to rank it as an organelle of some importance.

Also examined were stages in chromatophore development which showed relatively undifferentiated organelles (proplastids) becoming lamellate in older cells with a characteristic arrangement of the plates or discs of the mature chromatophore. These latter were found to consist of a unique limiting membrane, a relatively sparse distribution of plates, no grana and a single disc apparently paralleling the limiting membrane to which the other horizontal discs may be attached. In addition to their origin from non-lamellate proplastids, chromatophores may also duplicate themselves by simple constriction.

Floridean starch grains were observed outside the chromatophore and the possibility of initiation of these grains by a portion of the endoplasmic reticulum is considered.

Gland cells seem to have a high proportion of Golgi, and are believed to perform some kind of secretory function. Many of the Golgi vesicles seem to open up on the wall and presumably discharge their contents. The nature of the secretory product is not known.

Microfilm $2.75; Xerox $3.00. 52 pages.

FACTORS AFFECTING THE UPTAKE OF IRON IN SPIRODELA OLIGORHIZA (KURTZ) HEGELM.

(Order No. 61-3919)

James Robert Dawson, Ph.D.
Oregon State University, 1961

Major Professor: R. O. Belkengren

Spirodela oligorhiza was grown in sterile nutrient cultures with different levels and sources of iron, different levels of competing ions (manganese and molybdenum) and different nitrogen sources. Following periods of growth from one to thirty-nine days, plants were harvested, weighed and their iron content was determined.

Good growth was achieved at levels between 0.2 and 0.8 p.p.m. iron as the chloride, citrate and EDTA complex. At the higher iron level ferric chloride gave the best growth; at the low level ferric citrate was best. At the higher iron level iron uptake was highest from the chloride source, intermediate from the EDTA source and lowest from the citrate solutions. At the lower iron level uptake was highest from the citrate source, intermediate from the chloride source and lowest from the EDTA solutions. Iron was rapidly absorbed by the plants which attained concentrations as high as 600 p.p.m. within a week in fresh culture solutions. Plants grown in low iron levels recovered from growth inhibition more rapidly than did those grown at higher levels. Uptake of iron from solutions was not proportional to the nutrient levels. Plants grown at both levels and all sources of iron showed a tendency to lose iron to the nutrient solution. The optimum iron concentration for Spirodela oligorhiza grown under the conditions of this experiment was approximately 0.4 p.p.m.

Increasing manganese concentration of the nutrient solution from 0.25 to 1.0 p.p.m. resulted in an increase in plant weight and a decrease in iron absorbed. Iron-manganese ratios which provided the greatest weight increase did not coincide with those resulting in maximum iron uptake. Increase in molybdenum concentration from 0.0035 to 0.013 p.p.m. resulted in an increase in weight but decreased iron uptake in most cases.

The substitution of ammonia (as $(NH_4)_2SO_4$) for nitrate as a nitrogen source resulted in the development of lower pH and less growth and total iron uptake than were obtained

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when nitrate was used. Plants failed to grow at 0.8 p.p.m. iron with ammonia as a nitrogen source, but growth was obtained at the 0.08 p.p.m. level. Growth failure was not correlated with low pH and plants at the low iron level grew slowly for 25 days at a pH as low as 3.05.

Microfilm $2.75; Xerox $4.20. 80 pages.

GROWTH UNDER CONTROLLED CONDITIONS; AN EXPLANATION OF THE DISTRIBUTION PATTERNS OF THE MOSS Tetraphis pellucida.

(Order No. 61-3509)

Richard Townsend Turner Forman, Ph.D.
University of Pennsylvania, 1961

Supervisor: Ralph O. Erickson

The moss Tetraphis pellucida was grown under various combinations of controlled temperatures, relative humidities, pH, and light intensities in a microphytotron which is described. Extremes of these environmental factors separately for shoot growth are as follows: phototemperature 4.6°-30.6°C., nyctotemperature up to 29.0°C., relative humidity ca. 85%-100%, pH 3.0-6.5, and light intensity <30- >1600 foot candles, but in combinations these ranges are always considerably narrower.

The combinations of phototemperature, nyctotemperature, and relative humidity are sufficient for interpreting the continental distribution of the species. Mean monthly maximum and minimum temperatures and mean monthly night relative humidity from climatic stations across North America have been compared with the experimental growth limits. A map representing the area in which the plant could theoretically grow on this basis coincides closely with the actual distribution of the north temperate species. This method of relating experimental growth data to climatic data is compared with six other possible methods.

It is seen that temperature alone, relative humidity alone, mean annual temperature, and mean monthly temperature are all inadequate for a distribution explanation. Only the interaction of mean monthly maximum and minimum temperatures which consider both seasonal and diurnal fluctuations and relative humidity are suitable.

The experimental limits of growth or germination have been determined for several stages of the species life history, e.g., spore germination, protonema growth, growth of the leafy shoot, and gemma germination. Different combinations of environmental factors reveal relatively similar optimum conditions for all stages, but the environmental extremes are both quantitatively and qualitatively different for the stages.

An analysis of leaf variation from the experimental plants indicates that the higher the temperature, the narrower the leaf and more acute the leaf tip. Relative humidity apparently did not affect these characters or leaf size. With leaf morphology as an indicator of temperature, boreal Canada, the Rockies and the Appalachians should be colder than the southern part of its range, which agrees with climatic data.

Limited transplant studies were carried out adjacent to climatic stations in an environmental spectrum from alpine to warm deciduous forest types. With few exceptions growth took place only where the climatic data during the transplant period was within the experimental temperature and humidity limits for growth.

Field studies in New Hampshire, New Jersey, and North Carolina indicate that the species is found in forested regions and within these forests in coniferous stands or near water. Although it is most abundant on rotting coniferous and deciduous wood, the species is also found commonly on acid rock faces and soils with low or high organic content.

Finally the pattern of distribution of the species is found to be organized into a series of aggregations each composed of a number of sub-aggregations. This hierarchy of distributions has nine levels ranging from the worldwide distribution to the distribution of individual shoots in a clump. The distributions at most levels are limited by different environmental factors, e.g., relative humidity at one level, the substrate at another, etc. Secondly at some levels different factors are important in different parts of the range of a single aggregation, e.g., the continental distribution on North America is limited by low temperature to the north, combined low temperature and low humidity to the northeast, water to the east, low humidity to the south, high temperatures to the southeast and southwest, and water to the west.

It is concluded that in an adequate explanation of the distribution of a species, growth limits must be determined under combinations of environmental factors, and then applied to known environmental conditions in nature at all levels of distribution.

Microfilm $2.75; Xerox $4.20. 80 pages.

METABOLIC STUDIES OF BRYOPHYLLUM LEAF TISSUE WITH PARTICULAR REFERENCE TO CRASSULACEAN ACID METABOLISM

(Order No. 61-3522)

Andrew Wolodymyr Holowinsky, Ph.D.
University of Pennsylvania, 1961

Supervisor: David R. Goddard

Metabolic studies of Bryophyllum calycinum (Salisb.) leaf tissue were performed on plant material conditioned for vigorous Crassulacean Acid Metabolism. The investigations involved the use of radiochemical techniques employing radioglucose and C^{14} bicarbonate, inhibitor studies, manometric studies and chromatographic analysis. The experiments were performed on leaf tissue of plants which were maintained on a long day (17 hrs. light, 7 hrs. dark) photoperiodic regime. Only leaves which had just matured (as determined from growth studies) were used.

The operation in these tissues of a nonglycolytic pathway of metabolism was established from studies of the effects of iodoacetamide and fluoride on their respiration and fermentation. This was further substantiated from experiments with glucose-1-C^{14} and glucose-6-C^{14} where it was observed that 60% to 80% of the glucose is metabolized via the pentose phosphate pathway. In these experiments, the ratio of the radiochemical yields from

glucose-6-C^{14} to that from glucose-1-C^{14} : (C_6/C_1), as determined from the evolved $C^{14}O_2$, was observed to be temperature dependent. Below 15°C the ratio was less than 0.20 while at 25°C it was 0.35 and at 30°C it was 0.30. Dark $C^{14}O_2$ fixation into malic acid was inhibited with fluoride and iodoacetamide to a greater degree than respiration and glycolysis under similar conditions.

It was concluded that the findings were consistent with the postulated participation of the enzyme carboxydismutase in the pathway of the carboxylative synthesis of malic acid in the dark and supported the inference that in Crassulacean Acid Metabolism, the primary CO_2 acceptor, ribulose diphosphate is derived from the pentose phosphate pathway. Microfilm $2.75; Xerox $4.80. 92 pages.

CELL AGGREGATION IN DICTYOSTELIUM DISCOIDEUM

(Order No. 61-3125)

Theodorus Mattheus Konijn, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Kenneth B. Raper

Dictyostelium discoideum (Type, NC-4), substrains derived from it, and nine additional isolations of this species obtained from other natural sources were investigated with reference to the aggregative behavior of their myxamoebae in small populations. Nearly all small populations of 100 to 150 myxamoebae were able to aggregate independently of the strain used. D. discoideum (NC-4) was tested under various cultural and environmental conditions, including: (1) small populations grown in situ on washed and Purified agars where the growth of the myxamoebae was restricted by limiting the amount of nutrient bacteria; (2) small populations of pregrown myxamoebae that were harvested, washed and deposited on washed and Purified agars at different densities and under various environmental conditions.

The formation of aggregations seemed to be influenced by the following factors: (1) the existence of a critical relationship between the number of myxamoebae and their density per unit area of substrate; (2) the necessity for cells to remain inside the boundaries of the drop during the period after nutrient depletion in undisturbed cultures, or after deposition on agar as pregrown populations in minute drops of water or saline; (3) the removal by washing from normal agar of certain unidentified substances that permit spreading of implanted drops and accentuate cell dispersal; and (4) the optimal reconstitution and/or preparation of the agar gel.

The ability of a small population of 100 to 150 myxamoebae, or less, to aggregate was found to be independent of any special type of morphologically recognizable cell. Rather this capacity was thought to result from physiological changes emergent within the population as a whole following nutrient depletion, on the one hand, or implanation of a pregrown population on the other. Unusually large myxamoebae, believed to represent the so-called "I-cells" reported in existing literature, were occasionally observed; but they did not occur in a definite ratio, and their diverse characteristics seemed to suggest no common origin. Their total absence from the great majority of the test populations failed to support the notion that they represent a unique cell type of special significance to pseudoplasmodium formation in Dictyostelium discoideum.

The time interval between deposition of populations of washed myxamoebae and the onset of aggregation was affected by the light conditions. A delay of aggregation occurred in continuous light and in continuous darkness; whereas an uninterrupted dark period of six hours followed by light resulted in the shortest time interval and the myxamoebae started to aggregate about 10 hours after deposition. Aggregations formed in the light were smaller, and the number of sorocarps per unit area was greater than in darkness.

Attracting and responding myxamoebae were separated in place and in time. Preliminary experiments indicated that only attracting myxamoebae, or products secreted by them, were influenced by the light, and that the sensitivity of the responding cells remained unaffected by the existing light conditions. A possible interpretation of these observations has been given. The maximal distance over which aggregations were able to cause a response of myxamoebae in a neighboring population was determined. Finally the attraction of myxamoebae by their nutritional source, bacteria, was investigated.

Microfilm $2.75; Xerox $8.80. 195 pages.

DEVELOPMENTAL STUDIES ON REGENERATES OF CALLITHAMNION ROSEUM HARVEY

(Order No. 61-3528)

Eva Konrad, Ph.D.
University of Pennsylvania, 1961

Supervisor: Ralph O. Erickson

Diploid regenerates of Callithamnion roseum were grown in bacterized, enriched sea water media. Their development from single cells or cell filaments was followed by photomicrography and microcinematography. The apical growth pattern of the regenerates consists of a recurring alternation of oblique, unequal apical divisions and subsequent segment cell elongations, with the formation of protrusions which gradually develop into branches. The regular alternation of oblique mitotic spindles as an underlying factor of basic cell structure is discussed. A definite correlation was found between the formation of oblique crosswalls and branching. Although apical cell lineage is constant, it is not followed in a rigid way, and is maintained within the limits of a well balanced regulation. From time lapse movie data an analysis of the generated division and spatial hierarchy was worked out. Average division rates per day do not differ significantly in main axis and branches. Individually they increase in cell number in an arithmetic order, while the total cell output of the whole shoot grows exponentially with time. Branches appear to have two growth phases. The decreased growth rate in the second phase is probably correlated with the structural and functional differentiation of the branches, resulting in secondary branch formation. A pronounced morphogenetic effect of amino acids is reported on cell elongation, and their probable influence on branching is discussed.

Microfilm $2.75; Xerox $3.60. 65 pages.

SOIL ALGAE OF SOME CONIFER AND HARDWOOD FORESTS

(Order No. 61-3145)

James Walter Olson, Ph.D.
The University of Wisconsin, 1961

Supervisor: Associate Professor Richard I. Evans

The soil algal flora of 19 forest stands was studied and the algal communities were compared with one another on the basis of total species composition and the relative abundance of the major species. The forests studied included 4 white pine – red pine forests, 5 white oak forests and 10 maple forests. The data were based on collections of 5 soil samples, each 1 centimeter deep, from each of the forests. The algae were isolated into unialgal culture and studied for a period of several months.

Fifty seven species of algae were isolated from the soil samples, and these included thirty five species of Chlorophyceae, eleven species of Xanthophyceae, ten species of Cyanophyceae and one species of diatom.

A qualitative comparison of the soil algal communities in three forest types was made, based on the total species composition of each of the stands. Eleven species were found to occur in all three of the forest types, six species were restricted to the pine and maple forests, five species occurred only in pine forests, six species were common to the oak and pine forests, twelve species were found only in the oak forests, eight species occurred in both oak and maple forests and nine species were restricted to the maple forests.

Most of the species found to occur in only one of the forest types were either rare or were species with extremely scattered distributions. These species were not considered to be of value in comparing the algal communities.

When the frequencies of the algal species are considered, quantitative differences in the algal communities are apparent. The greatest concentration of soil algae was found in the pioneer forests, especially in the pine forests. The algal species having their peak development in the pine forests are Chlorosarcinopsis minor, Stichococcus bacillaris, Chlorococcum sp. and Chlorella vulgaris.

Only Chlorella ellipsoidea occurred more commonly in the oak forests than in the pine or maple forests.

More species of algae were isolated from the soils of the maple forests studied, but only Bracteacoccus minor was found to be characteristic of the maple forests.

Several of the members of the Xanthophyceae isolated in this study have proven to be new records for the country and many of the isolates are new to science.

A key is presented for the identification of the algal isolates and descriptions and illustrations of many of the species are included.

Microfilm $2.75; Xerox $6.20. 130 pages.

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CHEMISTRY, GENERAL

SYNTHESIS OF 1-AMINOMETHYL-2-MERCAPTOMETHYLNAPHTHALENE. STRUCTURE STUDIES ON AN INTERMEDIATE IMINONAPHTHODIHYDROTHIOPHENE.

(Order No. 61-3245)

Anthony Joseph Papa, Ph.D.
Washington State University, 1961

Chairman: Gardner W. Stacy

The objective of this investigation was to devise a synthesis of 1-aminomethyl-2-mercaptomethylnaphthalene, which was of interest as a prospective antiradiation agent. The scheme of synthesis which was employed involved the preparation of 2-mercaptomethyl-1-naphthonitrile as a key intermediate. The synthesis of this compound involved the bromination of 2-methyl-1-naphthonitrile with subsequent conversion of the bromomethylnitrile to the mercaptomethylnitrile through an isothiuronium salt intermediate.

Instead of the expected 2-mercaptomethyl-1-naphthonitrile, the synthetic approach in question led to the tautomeric 5-naphtho-2-imino(1,2-c)thiophene as the exclusive product in yields of 81%. The ring tautomeric form for this system was substantiated by the observation that the infrared spectrum of 5-naphtho-2-imino(1,2-c)thiophene did not contain a nitrile absorption band. Further evidence in support of this structure was obtained from its conversion to N-[1-methyl-(2-methylnaphthyl)]acetamide and subsequent desulfurization of this acetyl derivative with Raney nickel to N-1-(2-methylnaphthylidene)acetamide with subsequent reduction. Comparison of this product with a sample prepared by reduction of 2-methyl-1-naphthonitrile and acetylation of the resulting amine showed them to be identical as established by melting point and infrared spectra. The iminodihydrothiophene also was converted smoothly to the cyclic thiolactone by reaction with dilute hydrochloric acid.

Reaction of the iminodihydrothiophene with sodium borohydride-aluminum chloride at 25° resulted in the formation of two products, in two out of six experiments. In all cases, the physical properties and analytical data showed that 2,5-naphtho-(1,2-c)thiophene was obtained as the major or sole product. The structure of this compound was further demonstrated by desulfurization with Raney nickel to 1,2-dimethylnaphthalene identified as the picrate. The physical properties and elemental analysis of the other product (obtained in yields of 16%) showed it to be the desired aminothiol. Reduction at temperatures up to 100° did not appreciably change the results. When the reduction was carried out in excess of sodium borohydride relative to aluminum chloride, the desired aminothiol was obtained as the exclusive product in yields up to 90%. This reduction demonstrated the acyclic tautomeric species for this system. A further example of tautomeric behavior was established by the facile synthesis of the benzyl and 2,4-dinitrophenyl sulfide derivatives of 2-mercaptomethyl-1-naphthonitrile in alkaline solution; the structure of these compounds were confirmed by the presence of a strong nitrile band in the infrared spectra.

Support for the structure of 1-aminomethyl-2-mercaptomethylnaphthalene was afforded by examination of the infrared spectrum and the formation of two derivatives (1-aminomethyl-2-mercaptomethylnaphthalene disulfide dihydrochloride and 1-acetamidomethyl-2-mercaptomethylnaphthalene disulfide).

Attempted reductive cleavage of 5-naphtho-2-imino-(1,2-c)thiophene and 5-naphtho-2-(N-acetyl)imino(1,2-c)-thiophene with dimethylamine-borane gave 2,5-naphtho-(1,2-c)thiophene and 5-naphtho-2-acetamido(1,2-c)thiophene, respectively.

Concurrent with the above experiments, an alternate synthetic route to the desired aminothiol was investigated. This approach involved the synthesis of 2-benzylmercaptomethyl-1-naphthonitrile, from the reaction of 2-bromomethyl-1-naphthonitrile and benzyl mercaptan, which was subsequently reduced to 1-aminomethyl-2-benzylmercaptomethylnaphthalene hydrochloride with sodium borohydride-aluminum chloride. Although the formation of these intermediates was accomplished in excellent yield, it was not possible, under the conditions employed, to effect the reductive cleavage of the latter compound with sodium in liquid ammonia to 1-aminomethyl-2-mercaptomethylnaphthalene; instead cleavage to 1-aminomethyl-2-methylnaphthalene hydrochloride occurred.

Microfilm $2.75; Xerox $3.00. 54 pages.

THE PREPARATION OF SOME HYDROXYMETHYLBENZALDEHYDES

(Order No. 61-3246)

Peter Popovich, Ph.D.
Washington State University, 1961

Chairman: Stewart E. Hazlet

Four hydroxymethylbenzaldehydes (viz.: m-hydroxymethylbenzaldehyde, p-hydroxymethylbenzaldehyde, 2-bromo-4-hydroxymethylbenzaldehyde, and 3-bromo-4-hydroxymethylbenzaldehyde) have been synthesized. The general method of preparation involved the following steps: esterification of a toluic acid; side-chain halogenation of the ester to an α-bromo derivative; conversion of the α-bromo compound to a formylbenzoate; protection of the aldehyde by formation of an acetal; reduction of the ester function (to the hydroxymethyl group) with lithium

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aluminum hydride; and hydrolysis of the hydroxymethylbenzaldehyde acetal to the desired hydroxymethylbenzaldehyde.

2,4-Dinitrophenylhydrazones have been prepared as derivatives of the hydroxymethylbenzaldehydes.

p-Hydroxymethylbenzaldehyde has been shown to undergo the Cannizzaro reaction.

Microfilm $2.75; Xerox $3.80. 69 pages.

CHEMISTRY, ANALYTICAL

AN APPARATUS FOR AUTOMATIC CONTROLLED POTENTIAL ELECTROLYSIS USING AN ELECTRONIC COULOMETER AND ITS APPLICATIONS

(Order No. Mic 60-6282)

Ram Dev Bedi, Ph.D.
Indiana University, 1960

An electronic instrumental circuit has been constructed which can perform automatic controlled-potential and constant current coulometric electrolyses. It includes a constant current source to supply current to the electrolysis circuit, an electronic tripper circuit to limit the potential range of the working electrode and a signal generator-scaler for measuring the total time during which constant current is passing to the electrolysis circuit. A large capacitor connected in parallel to the cell serves as a constant current source for the electrolysis cell in controlled-potential electrolyses but is bypassed in constant-current electrolyses. By measuring the time that the constant current is applied to the electrolysis circuit and thus the total number of coulombs used for the electrolysis, the concentration of electroactive species can be calculated from Faraday's law.

The instrument has been successfully tested for the following reactions:

Reduction reactions: Deposition of silver and copper; determination of ferric ions in pure solution, in the presence of yttrium and gadolinium and in the presence of nickel, cobalt and tungsten; standardization of dichromate and permanganate solutions.

Oxidation reactions: Determination of iron in a mixture of dichromate and ferric ions; preparation of standard nickel solution through electro-oxidation of a pure nickel electrode.

Precipation reaction: Determination of chloride, bromide and iodide ions; determination of tungstate ions.

Determination of E_o of organic reagents which can undergo reversible oxidation and reduction reaction.

Along with the above methods a successful potentiometric method for molybdate ion determination was also developed.

Possible sources of errors are discussed and methods for further instrumental improvements and applications are proposed. Microfilm $2.75; Xerox $5.20. 101 pages.

METAL CHELATES OF 4-HYDROXYBENZOTHIAZOLE AND ITS DERIVATIVES

(Order No. 61-3259)

Pao-Kuo Feng Chin, Ph.D.
University of Pittsburgh, 1961

Supervisor: Quintus Fernando

4-Hydroxybenzothiazole was prepared by Erlenmeyer's method (H. Erlenmeyer and H. Ueberwasser, Helv. Chim. Acta. 25, 515, 1942); 4-hydroxybenzothiazole-7-sulfonic acid and 5,7 dibromo-4-hydroxybenzothiazole were prepared by direct sulfonation and bromination respectively; 2-amino-4-hydroxybenzothiazole was prepared by demethylation of 2-amino-4-methoxybenzothiazole.

The acid dissociation constants of 4-hydroxybenzothiazole and its derivatives have been determined by a potentiometric method in 50% v/v dioxane-water and spectrophotometrically in aqueous media.

The formation constants of divalent metal chelates of 4-hydroxybenzothiazole and its derivatives have been determined potentiometrically in 50% v/v dioxane-water. The order of stability of the metal chelates is Cu > Pb, Ni, Co > Zn > Cd > Mn > Mg for 4-hydroxybenzothiazole; Cu > Ni > Co > Zn > Mn for 4-hydroxybenzothiazole-7-sulfonic acid, and Cu > Ni, Zn > Co > Mn for 2-amino-4-hydroxybenzothiazole. The low stability of 2-amino-4-hydroxybenzothiazole Ni (II) chelate is anomalous and has been attributed to π bond formation between the metal and the nitrogen atom.

Both divalent metal chelates and lanthanon metal chelates were prepared and analyzed by a micro-gravimetric method. An amperometric titration of 4-hydroxybenzothiazole using bromine as titrant has been used to determine the composition of the lanthanon metal chelates.

The infrared spectra of metal chelates of 4-hydroxybenzothiazole have been determined. The absorption peaks at 1500 cm^{-1} and 1300 cm^{-1} have been assigned to C - O vibrations. The shift of the C - O vibrational frequencies of transition metal chelates were found to follow the order of increasing stabilities of the metal chelates.

The reactions of the derivatives of 4-hydroxybenzothiazole with various metal ions have been determined.

It was found that 4-hydroxybenzothiazole reduces cupric ion to cuprous ion.

Microfilm $2.75; Xerox $7.80. 169 pages.

POLAROGRAPHIC AND CONTROLLED-POTENTIAL COULOMETRIC INVESTIGATION OF MANGANESE IN SODIUM CYANIDE SOLUTION

(Order No. 61-3756)

Stephen A. Moros, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Louis Meites

The polarographic wave of Mn(II) in 1 F NaCN has been interpreted as corresponding to the reversible reduction to Mn(O) in spite of the known existence of $K_5Mn(CN)_6$ and in

spite of the fact that its half-wave potential is more positive than the standard potential of the half-reaction Mn(II) + $2e^-$ = Mn(O). Upon polarographic and controlled-potential coulometric examination, the more recent interpretation, reversible reduction to Mn(I), was confirmed. The product of air oxidation was shown to be Mn(III) both by the ratio of the heights of the waves—the first, reflecting reduction to Mn(II), merges with the wave due to anodic dissolution of mercury—and coulometrically, by reduction at -1.0 volt vs. S.C.E. The addition of sodium hydroxide to solutions of cyanomanganate(II) ion in 1 F NaCN results in the formation of cyanodihydroxomanganate(II) ion as gauged from the ratios of the height of the wave at -1.36 volts to the height of the one formed at -1.72 volts. The latter represents an irreversible two-electron reduction of the cyanohydroxo complex to Mn(O) in contrast to the assumption of earlier investigators that the reduction of Mn(II) complexes containing four or more cyanide groups is a one-electron process.

The instability of cyanomanganate(I) ion, whose anodic half-wave potential is among the most negative ever reported, is presumed to be responsible for the deviation from linearity of the limiting current with square-root of mercury height found for the second wave of Mn(III) in 1 F NaCN; the relationship for the first wave was found to be essentially linear.

Calibration of the coulometer employed revealed that at low currents the losses of the tachometer generator system are equivalent to the loss of a small constant current, 0.025% of full scale; a constant loss was observed by previous investigators to be characteristic of permanent magnet d.c. integrating motors. The coulometer employed was linear over a wider range and sustained smaller losses at low currents. Measurements made with this equipment revealed the properties and origins of several types of background effects often encountered in controlled-potential coulometric analysis.

Specifically, the reduction of Mn(II) in 1 F NaCN at -1.5 volts is complicated by (1) the faradaic impurity current reflecting the reduction of traces of impurities, (2) the continuous faradaic current arising from the slow reduction of a constituent of the supporting electrolyte, (3) the kinetic current reflecting the reduction of Mn(II) arising from the instability of Mn(I), (4) the induced current arising from the accelerated reduction of the supporting electrolyte during the reduction of Mn(II), and (5) the charging current required by the double layer capacitance, although it is negligible except at the microgram level.

A study of the kinetic current indicates that the decomposition of Mn(I) involves a dimer in equilibrium with the reactive monomer; the rate constant of the half-order (over-all) reaction is 7.8×10^{-5} $mmole^{1/2}$ $liter^{-1/2}$ $sec.^{-1}$, in good agreement with anodic and cathodic polarographic evidence, and in fair agreement with spectrophotometric evidence despite spectral complexity. The induced current was manifested as a 3-4% greater quantity of electricity than that computed for the reduction of known quantities of manganese(II); it may reflect a sluggishness in the equilibrium with dimer or the reduction of a protonated intermediate to hydrogen, but the effect is too small to permit unambiguous interpretation.

Corrections for background effects in general, and specifically for the manganese case are described. While by no means providing results which are attained under ideal conditions, the application of these corrections to data which may otherwise appear to be ambiguous provides results which are satisfactory for many purposes.

Microfilm $2.75; Xerox $8.60. 188 pages.

CHEMISTRY, BIOLOGICAL

THE EFFECT OF ULTRAVIOLET IRRADIATION ON NUCLEIC ACID ISOLATED FROM TOBACCO MOSAIC VIRUS

(Order No. Mic 61-1863)

David Richard Coahran, Ph.D.
University of Pittsburgh, 1961

The effects of ultraviolet irradiation, mainly of 2537 Å wavelength, on ribonucleic acid (RNA) extracted from tobacco mosaic virus (TMV) were studied. Breakage of RNA by irradiation was measured by the use of an ultracentrifuge.

The quantum yield for breakage of RNA in solution was calculated to be 3.5×10^{-6} moles/einstein. Frozen RNA solutions, irradiated at dry ice to liquid nitrogen temperatures, gave a quantum yield for breakage of 8.1×10^{-6}. The heating to 68-70° C of RNA solutions which had been irradiated at dry ice or liquid nitrogen temperatures increased the quantum yields for breakage. The quantum yield for material irradiated at dry ice temperature and heated was 2.0×10^{-5}, and that for material irradiated at liquid nitrogen temperature and heated was 3.6×10^{-5}.

It has been suggested by Doty, et. al., that the TMV RNA strand has regions of helicity interspersed with regions of random coiling. A hydrogen-bonded secondary structure is believed to stabilize the helical regions. The observed variations in quantum yield can be explained in terms of this model.

Heating to 70° C is known to disrupt the hydrogen-bonded secondary structure almost completely. This would allow broken fragments of RNA to separate, increasing the apparent degree of breakage. Freezing might partially disrupt the secondary structure, accounting for the apparent difference in the sensitivity of RNA in liquid and frozen states.

The identity in breakage rate of material irradiated at dry ice and liquid nitrogen temperatures, together with the difference in rates when irradiated materials are subsequently heated, suggests that the sensitivity of non-helical segments of RNA is the same at the two temperatures, but that the sensitivity of helical segments varies with temperature.

The quantum yield for biological inactivation of RNA solutions irradiated at dry ice temperature was 7×10^{-4}, in reasonably good agreement with the value of 3×10^{-4} reported by McLaren and Takahashi for inactivation in the liquid state.

Microfilm $2.75; Xerox $3.00. 43 pages.

STUDIES ON THE STRUCTURE OF THE GAMMA GLOBULINS

(Order No. Mic 61-1843)

Gerald Maurice Edelman, Ph.D.
The Rockefeller Institute, 1960

Using several chemical and enzymatic methods to degrade the γ-globulin molecule, information about its chemical and immunological structure has been obtained. An hypothesis that γ-globulin may contain chemically dissociable subunits was developed after a review of data in the literature on the N-terminal amino acid content of this protein. To test this hypothesis, various γ-globulins were reduced by thiol compounds in the presence of urea, and the molecular weight and sedimentation coefficients of the products were determined. Because the products of reduction were insoluble in aqueous solutions, the ultracentrifugal analyses of molecular weights were done in strong urea solutions by the Archibald principle.

The apparent molecular weight of human fraction II γ-globulin fell from 189,000 to 48,000 after reduction. Rabbit γ-globulin was similarly affected when reduction was prolonged. A human pathological macroglobulin having a molecular weight of about one million dissociated to fragments with a molecular weight of 41,000 after reduction in urea.

The sulfhydryl groups of human γ-globulin were titrated amperometrically before and after reduction. Human γ-globulin possessed no free sulfhydryl groups in aqueous solution. In 8 M urea, between 0.4 and 0.9 moles of titratable sulfhydryl groups were found per mole of human fraction II γ-globulin. After reduction the sulfhydryl titer increased markedly. Dissociation of a pathological 19S macroglobulin to 7 S subunits by β-mercaptoethylamine was accompanied by the appearance of 28 sulfhydryl groups per mole of protein with an assumed molecular weight of one million.

Chemical treatments other than reduction were used to determine the type of bond involved in holding the fragments together. It was concluded from these studies that γ-globulin molecules consist of several subunits linked by reducible bonds, probably disulfide bonds. The possibility that other bonds are involved is discussed.

The products of chemical treatment lacked antigenic activity when tested with specific anti-γ-globulin sera. To explore the antigenic structure of γ-globulin, the molecule was degraded with papain, which produced soluble fragments having antigenic activity. Three chromatographically separable fragments with uncorrected sedimentation coefficients of 3.8 S were obtained. These products were subjected to immunological analysis, using gel diffusion methods including immunoelectrophoresis and Ouchterlony plates.

Two of the fragments were antigenically distinct. One, the F component, had a mobility faster than the original γ-globulin, and the second, the S component, had a slower mobility. After chromatographic isolation, these components could be used to absorb their respective antibodies from various anti-γ-globulin sera. The relative amounts of F and S antibodies differed in antisera from individual rabbits that had been immunized with whole γ-globulin. When certain homogeneous myeloma proteins were treated with papain, F and S components were produced. Additional minor antigenic components were also discernible in some cases.

Whole γ-globulin was separated by zone electrophoresis into a fast-migrating and more slowly migrating fraction. Each of these gave rise to F and S components after treatment with papain. The F components of the two γ-globulins had similar mobilities, but the S components, although antigenically similar, showed marked mobility differences. The mobility differences of the parent γ-globulins appeared to be related to differences in the S components.

Certain antisera against pathological γ-globulins were found to give double precipitin lines in agar with a number of γ-globulin preparations. Each of the lines was shown to be related to either S or F antigenic determinants of γ-globulin. The question of whether these findings indicate heterogeneity of γ-globulin in relation to F and S components, or whether separate antigenic determinants on one molecule can give rise to separate precipitin lines, is discussed.

Possible relations between reductive and enzymatic dissociation of γ-globulin are considered. Some implications of the findings for theories of antibody formation, and for the pathogenesis of diseases of γ-globulin production are also mentioned.

Microfilm $2.75; Xerox $6.00. 125 pages.

ENZYMATIC SULFURYLATION MECHANISMS

(Order No. Mic 61-1845)

Irving Hyman Goldberg, Ph.D.
The Rockefeller Institute, 1960

Sulfate activation and transfer to lipids, polysaccharides, and aminoalkyl phenols have been studied in a variety of biological systems. The transfer of $S^{35}O_4$ from radioactive 3'-phosphoadenosine 5'-phosphosulfate ($PAPS^{35}$) into lipid-soluble material has been investigated in cell-free preparations of rat brain and liver. In brain of 10-20 day old rats activity was found in the particulate fraction of the homogenate, whereas in young adult rat liver activity resided in the supernatant fraction (105,000 x g). In both systems incorporation was stimulated by the addition of a crude mixture of the isomers of N-acetyl sphingosine. Evidence accumulated suggesting that the radioactive sulfolipids produced by these two systems were probably different.

Synthesis of a Cerebroside Sulfate-like Compound in Rat Brain

By partial acid hydrolysis of the brain S^{35}-sulfolipid, a radioactive fragment was obtained which appeared to be a sugar sulfate. It is suggested that the compound formed by the brain particles is the N-acetyl analogue of cerebroside sulfate. The synthesis seemed to go by way of the ceramide (N-acyl sphingosine). A partial dependency on added ATP and covalent cation could be demonstrated. Stimulation of incorporation by uridine nucleotides, however, was not consistent.

Direct Sulfurylation of N-acetyl Sphingosine in Rat Liver

The liver system was investigated more extensively. The threo isomer of N-acetyl sphingosine was the active

species. Sphingosine, cerebroside, and other ceramides with longer-chained fatty acids were only slightly active, if at all. The relation of structure and solubility properties to the suitability of the lipid as a substrate for the enzyme system is described.

Chemical Evidence – The enzymatically produced sphingolipid has been characterized by partition and ion-exchange chromatography, paper electrophoresis, and chemical degradation. The formation of a compound resembling glycolaldehyde sulfate following alkaline hydrolysis and periodate oxidation indicates that the sulfolipid formed in the liver system is probably, at least in part, the direct primary hydroxyl-sulfate conjugate of N-acetyl sphingosine.

N-acetyl sphingosine + PAPS → N-acetyl sphingosine - SO_4

Enzymatic Evidence – The direct sulfurylation mechanism in the liver is also suggested by the enzymatic data. Fractionation of the liver supernate has been carried out by acid precipitation, alcohol fractionation, and DEAE-cellulose chromatography. Complementary 0-20% and 20-60% fractions were obtained by the alcohol step. The combined fractions synthesized sulfolipid only from PAPS and not from inorganic sulfate plus ATP. The stimulation of incorporation into sulfolipid provided by the addition of ATP to the combined ethanol fractions, could not be found when the DEAE fractions were tested. This finding supports the thesis of a direct sulfurylation of the ceramide by PAPS. The role of the second alcohol fraction, and the stimulation by ATP before the column procedure have not been clarified.

Parallels with Chloramphenicol-sulfurylation – Additional evidence favoring direct sulfurylation in the liver system is provided by experiments on the sulfate conjugation of the chloramphenicol isomers. It was reasoned that if the direct sulfurylation of the ceramide was taking place in the enzymatic reaction, the same system might also sulfurylate chloramphenicol (D-threo) which bears striking structural similarities to the ceramide. Such proved to be the case. All four isomers of chloramphenicol could be sulfurylated with PAPS by the same partially purified enzyme fractions as above; the D-erythro isomer was about 20-times as active as the natural D-threo. The enzymatic product is the same as chemically synthesized chloramphenicol monosulfate. The sulfate was shown to be attached to the primary hydroxyl function of the chloramphenicol. That the sulfokinase for chloramphenicol and N-acetyl sphingosine are probably the same, was also indicated by the inhibition of sulfurylation of the latter by the former in the presence of excess $PAPS^{35}$. This system was shown to be distinct from the sulfokinases of the phenols and dehydroepiandrosterone. The structural, steric, and electronic requirements for sulfurylation of derivatives and compounds related to chloramphenicol have been studied.

Sulfurylation in Marine Organisms

Extracts of marine organisms were examined for their ability to activate and transfer sulfate. PAPS synthesis, and transfer of sulfate to polysaccharide were demonstrated in cell-free extracts of the mucous gland of the marine snail, Busycon canaliculatum, and in extracts of various marine algae. The in vivo assimilation of $S^{35}O_4$ by photosynthesizing Porphyra umbilicalis was also studied. Incorporation of $S^{35}O_4$ into several alcohol-soluble compounds and into polysaccharide was found. The sulfurylation from $PAPS^{35}$ of aminoalkyl phenols such as tyramine, noradrenaline, serotonin, 5-hydroxyltryptophan, tyrosine, or their metabolites, was observed in extracts of the snail gland and of rat liver.

Microfilm $2.75; Xerox $6.80. 145 pages.

BODY FLUID AND SKELETAL TISSUE INTERRELATIONS IN THE AMERICAN LOBSTER

(Order No. 61-3671)

Dora Kruse Hayes, Ph.D.
University of Minnesota, 1961

In control intermolt lobsters maintained at 8° C in artificial sea water, average hemolymph calcium level was 34.5 ± 0.98 mEq. per liter of hemolymph. Eighty-five per cent of this calcium was diffusible. $Citrate^{-3}$ ion was present at a concentration of 0.16 ± 0.022 mEq. per liter, an amount insufficient to sequester appreciable calcium. Sodium, potassium, chloride, and phosphate were present at levels comparable to those obtained by other investigators, while 10.8 ± 1.79 mEq. of HCO_3^- per liter were found.

Claw shell contained more sodium, potassium, phosphate, and chloride, and less calcium and citrate than carapace shells.

After two hours in artificial sea water labelled with calcium-45 and strontium-85, the greatest concentration of both isotopes in hard tissues was in the claw, with the carapace containing slightly more activity than the mandible and the gastric mill containing negligible quantities of isotope. On a dry weight basis, the gill contained more activity than the hepatopancreas, hemolymph, and muscle. Only the gill and the mandible exhibited a statistically significant (5 per cent level) discrimination against strontium-85.

After two hours in sea water labelled with cesium-134, shells and gills contained isotope, while other soft tissues contained little or no activity, suggesting a block to cesium-134 transport across the gill membrane.

Fluoride-18 and chloride-36 were injected simultaneously. After two hours, isotopes were found distributed equally in muscle, urine, and hemolymph, while twice as much chloride as fluoride was observed in hepatopancreas and no chloride was found in the shell.

Hypocalcemia was induced by placing lobsters for six days in two changes of sea water containing no calcium. At least one slow and one rapid process were responsible for calcium loss. Shell sodium and phosphate increased 25-30 per cent. Hypocalcemic animals placed in sea water labelled with calcium-45 and strontium-85 exhibited greater uptake of both isotopes in carapace, claw and mandible, but not in soft tissues. All tissues except mandible showed a significantly greater uptake of calcium-45 over strontium-85, with soft tissues showing a greater discrimination than hard tissues. Hypocalcemic gill discriminated against strontium-85 to a greater degree than

normal gill. Radioautographs of carapace and claw sections indicated most activity was in the outer layers of the shell.

Five per cent CO_2-95 per cent O_2 bubbled into sea water caused a decrease in sea water pH to 6 and a variable decrease in hemolymph pH to levels as low as 6.5. After 1.5 hours, hemolymph total CO_2 and inorganic phosphate increased, but no increase was observed in calcium ion. No changes were detected in shell composition.

Neither 2 mg. DOCA implanted in tail muscle, nor 150 IU parathormone IM affected levels of shell or hemolymph ions.

Epicuticle plus pigmented layers of shells decalcified with ethylene diamine tetra-acetic acid sodium salt exhibited a greater affinity for calcium than did the principal calcified zone.

Microroentgenograms of carapace and claw shells indicated greater mineralization in the outer third of the pigmented layer, in areas corresponding to early interprismatic spaces, and in claw around tegumental gland ducts and hair pores of the principal calcified zone. Variations in the mineral content of lamellae of the principal calcified zone were visible in claw but not in carapace.

Citrate metabolism in the rat and the dog was compared to that of the lobster.

Microfilm $3.75; Xerox $13.30. 292 pages.

REACTIONS GOVERNING AMINO ACID INCORPORATION INTO THE PROTEINS OF THE ISOLATED CELL NUCLEUS

(Order No. Mic 61-1846)

Johns Wilson Hopkins, III, Ph.D.
The Rockefeller Institute, 1960

The experimental work described in this thesis is concerned with the mechanism of protein synthesis in cell nuclei. Attention has been focused on two of the steps involved in amino acid incorporation into proteins: 1) amino acid activation, and 2) transfer of the activated amino acid to a nuclear ribonucleic acid to which it is bound in an energy-rich linkage.

Extracts from isolated calf thymus nuclei catalyze the activation of the naturally occurring L-amino acids. These enzyme fractions are prepared by extraction of nuclei with neutral salt and subsequent precipitation from this extract at pH 5. The activation reaction requires adenosine triphosphate. An enzyme-bound amino acyl-adenylate and pyrophosphate are formed according to the reaction:

$$\text{Enzyme} + \text{Amino acid} + \text{ATP} \rightleftharpoons \text{Enzyme} - \text{AMP} - \text{Amino Acid} + \text{PP}$$

This reaction is reversible and has been conveniently studied by measuring the amino acid-dependent exchange of radioactive pyrophosphate with ATP. D-amino acids have no effect on the system.

In order to eliminate the possibility that amino acid activating enzymes are present in nuclei merely as a result of adsorption, nuclei have been prepared by a technique which precludes exchange of material between the nucleus and cytoplasm during the course of isolation. This technique was first developed by Behrens and involves the use of non-aqueous solvents. Amino acid activating enzymes have been prepared from calf thymus nuclei and chicken kidney nuclei which had been isolated using the nonaqueous technique. The enzyme content of nuclei prepared in nonaqueous media has been compared with that of whole tissue controls. In the thymus cell, where the nucleus comprises 61% of the mass, 70% of the total amino acid activating activity is found in the nucleus. In chicken kidney, on a dry weight basis, amino acid activating enzymes are present at one-half the concentration in the nucleus as in the cytoplasm. Activating enzymes are also found in calf liver nuclei.

Subsequent to their activation, amino acids are transferred to a ribonucleic acid in the nucleus which functions as an amino acid carrier. The reaction in the nucleus, which is similar to that described for cytoplasmic systems which incorporate amino acids, is formulated as follows:

$$\text{Enzyme} - \text{AMP} - \text{Amino Acid} + \text{RNA} \rightleftharpoons \text{Enzyme} + \text{AMP} + \text{RNA-Amino Acid}$$

The reaction can be followed in the intact nucleus. RNA can be prepared from calf thymus nuclei which have been incubated with a C^{14}-amino acid and its radioactivity determined. Leucine-C^{14} is rapidly incorporated into nuclear RNA for 10 min, after which time the specific activity of the RNA remains constant. The incorporation into protein exhibits a lag period of about 10 min and then proceeds linearly. These experiments suggest a direct role of nuclear RNA in protein synthesis in the nucleus. Under similar conditions no incorporation of amino acid into deoxyribonucleic acid can be detected.

Fractionation of thymus nuclei after they have been incubated with C^{14}-amino acid indicates that the RNA active in incorporating amino acids is contained in a fraction easily extracted in neutral buffer solutions. No evidence was found for binding of amino acids by the RNA of the nucleolus.

Labeling of nuclear RNAs by C^{14}-amino acids can be carried out either in the intact nucleus as described above or in nuclear extracts. The pH 5 activating enzyme preparations from calf thymus nuclei contain a few per cent RNA. During incubation of this fraction under suitable conditions with ATP and a radioactive amino acid, the RNA incorporates the amino acid. That incorporation is into the RNA can be shown by isolating the RNA by the phenol method and measuring its radioactivity. Although the RNA-amino acid complex is relatively stable in acid, treatment with dilute base or ribonuclease readily releases the amino acid. After RNAase treatment an acid soluble fragment containing the radioactivity is released and can be isolated using either paper chromatography or filter paper electrophoresis. Upon subsequent treatment of this fragment with dilute alkali, the radioactive amino acid and a nucleoside can be isolated. The nucleoside appears to be adenosine. By analogy with the situation found in cytoplasmic systems which incorporate amino acids (Zachau et. al., 1958), these findings suggest that the amino acid has been esterified to the ribose of a terminal adenylic acid of RNA.

The pH 5 fraction from thymus nuclei is also capable of transferring activated amino acids to isolated RNA from thymus nuclei which is added to the system. Preliminary experiments have indicated that the pH 5 enzymes

from calf thymus nuclei can transfer amino acids to RNA from calf liver nuclei as well. In addition activating enzymes from guinea pig liver cytoplasm are effective in labeling both thymus and liver nuclear RNAs. These experiments with leucine suggest a lack of specificity of nuclear enzyme and RNA.

The effect of the antibiotic, chloramphenicol, on protein synthesis in calf thymus nuclei has been studied in some detail. High concentrations of chloramphenicol block completely over-all synthesis of protein in isolated calf thymus nuclei (Breitman and Webster, 1958). It has been shown that chloramphenicol does not inhibit ATP synthesis in these nuclei, nor has it any effect on amino acid activation. Furthermore, its presence does not prevent the incorporation of amino acid into nuclear RNA. Use of chloramphenicol has given a means of eliminating the possibility that the presence of labeled amino acid in nuclear RNA is really due to a small amount of highly labeled protein contaminant. Incorporation into protein can be stopped, and yet nuclear RNA continues to take up the amino acid as if the antibiotic were not present. From these experiments it appears that the inhibitory action of chloramphenicol must be focused on a later step in protein synthesis.

The effect of another antibiotic, puromycin, was similarly investigated. Puromycin is of particular interest since its structure closely resembles part of the amino acyl-RNA complex which is postulated as an intermediate in protein synthesis. Puromycin inhibited incorporation of amino acids into protein by the intact calf thymus nucleus. At a concentration (80 μM) where protein synthesis was 85% inhibited, little or no effect was shown on incorporation of nucleic acid precursors in RNA by these nuclei. The action of puromycin can be considered as a competition between the antibiotic and the natural amino acyl-RNA complex. The fact that nearly all amino acid incorporation into nuclear protein can be blocked by puromycin suggests strongly that the normal incorporation pathway of amino acid incorporation into protein is through an amino acyl-RNA intermediate.

Although sodium ions are essential for over-all incorporation of amino acid into proteins of calf thymus nuclei, it has been demonstrated that replacement of sodium ions by potassium ions does not inhibit either amino acid activation or transfer of the amino acid to nuclear RNA. Several quaternary ammonium ions which can serve as sodium substitutes in nerve physiology have been found ineffective in substituting for sodium ions in the thymus nucleus.

It appears that the pathway of amino acid incorporation in the nucleus is quite similar to that in the cytoplasm. Amino acids are activated in the same way and are transferred to a "carrier" RNA. There is recent evidence which shows that nuclear ribonucleoprotein particles participate in the actual formation of peptide linkages in a manner similar to their participation in cytoplasmic protein synthesis (Allfrey et. al., 1960; Frenster, 1960).

Microfilm $2.75; Xerox $6.80. 144 pages.

STUDIES ON COCONUT OIL. I. RELATION TO GROWTH AND SERUM CHOLESTEROL LEVELS OF RATS. II. RELATION TO BILE ACID EXCRETION IN MAN.

(Order No. 61-3886)

Carmen Llamas Intengan, Ph.D.
Columbia University, 1961

The main objective of this study is to find out if the nutritional value of coconut oil can be improved by substituting peanut oil for part of the coconut oil in the diet. The criteria used for evaluating results are growth and cholesterol levels of rats and cholesterol levels as related to bile acid excretion in man.

Part I describes a bioassay method, using cholesterol-cholic acid-fed rats, that can measure both the growth and serum cholesterol levels as affected by changes in dietary fat. Experiment 1 shows that the substitution of 10% and 20% of coconut oil with peanut oil and incorporated in the diet at a 10% level lowers the increment in cholesterol levels of the rats. However, the higher percentage of peanut oil enhances growth more significantly than the 10% peanut oil. Rats on hydrogenated coconut oil gives the poorest growth response and significantly increases cholesterol levels when compared with the coconut oil-fed control.

In experiment 2 evidence is given, by using equivalent amounts of pure esters of linoleic acid in place of that present in peanut oil in the fat mixture, that this fatty acid accounts for the improved growth and lower cholesterol levels of the rats.

In a third series of experiments, oleic acid, the predominant fatty acid in peanut oil did not augment growth of the animals and has a highering effect on cholesterol levels. This is shown by feeding rats with fat mixtures of coconut oil with triolein and with selectively hydrogenated peanut oil. The diet containing the coconut-peanut oil mixture is shown to promote comparable growth and is more effective in lowering increments in cholesterol levels than either lard or peanut oil.

In experiments 2 and 3, comparable groups of rats are given diets containing synthetic preparations of triglycerides from coconut oil having carbon chain lengths C_8-C_{10} (MCT), C_{12} (LCT_3), and C_8 - C_{18} (LCT). Poorest growth is shown by the MCT-fed group followed by the LCT_3-fed rats. The LCT mixture of fatty acids promote better growth. However, all fractions give markedly elevated serum cholesterol levels.

Part II of this study is done on human subjects in which serum cholesterol levels as affected by changes in dietary fat are being related to excretions of fecal bile acids. A combined method, utilizing ion-exchange resin column chromatography for bile acid separation, and glass paper chromatography for quantitative measurements of specific purified bile acids is developed for this study. A detailed description of these methods has been presented.

The 3 subjects in this study have hypercholesteremia. They are hospitalized during the experimental period and a liquid formula diet is given as the only source of nutriment. Fats tested constitute 40% of the total calories while 43% and 17% are derived from carbohydrate and protein respectively. Two subjects are given the same dietary period: corn oil, coconut oil, MCT and LCT_3 periods. On

the corn oil regimen, a significant decrease in serum cholesterol accompanied by a large increase in fecal bile acid excretion is noted. When coconut oil is isocalorically substituted for corn oil, there is a decrease in bile acid excretion. MCT has a delayed lowering effect on serum cholesterol and results indicate a need for a longer period of study. LCT_3 is not tolerated by both subjects.

The coconut-peanut oil mixture which is found to be hypocholesteremic in rats is found to lower the cholesterol level of the third subject. The decrease in cholesterol level is comparable to the response of the previous subjects on corn oil. However, an unusual finding is the absence of fecal bile acid from this subject. This deserves further study.

Chenodeoxycholic and deoxycholic acids are the predominant bile acids found in human feces at a ratio of usually more than one. Lithocholic and cholic acids are found in smaller quantities in some samples. The chromatograms indicate the presence of small but measurable amounts of other bile acid metabolites presumably ketonic derivatives of bile acids.

Microfilm $2.75; Xerox $9.00. 199 pages.

THE INHIBITION OF MUSHROOM TYROSINASE BY ITS APOENZYME, A PROTEIN INHIBITOR, AND CERTAIN REAGENTS.

(Order No. 61-3641)

Yashwant Dattatraya Karkhanis, Ph.D.
The Florida State University, 1961

A study of inhibition of mushroom tyrosinase has been made using inhibitors of widely different types. During the purification of tyrosinase from mushrooms, a protein inhibitor was isolated which was associated with tyrosinase until the last step of its purification. Chromatography of crude tyrosinase on DEAE-cellulose separated protein inhibitor from purified tyrosinase. This protein inhibitor appeared to be a single component, both by ultracentrifugal and electrophoretic criteria of purity. It contained 0.06 percent copper compared to 0.20 percent copper present in purified tyrosinase and was a competitive and a reversible inhibitor of tyrosinase. When it was incubated with cupric ions, it lost its inhibitory activity after six hours and transformed into a fully active tyrosinase which had kinetic properties similar to tyrosinase purified from mushroom. Apotyrosinase made by removing copper ion of tyrosinase by cyanide is also a competitive and reversible inhibitor of mushroom tyrosinase.

L-Thyroxin and triiodo-L-thyronine are effective inhibitors of mushroom tyrosinase only after incubation with tyrosinase. After 10-12 hours incubation with tyrosinase at 30°, 3.0×10^{-5} M thyroxin and triiodothyronine produced 50 percent inhibition. For complete inhibition, thyroxin needed 18 hours and triiodothyronine needed 20 hours incubation. At 3° incubation with thyroxin, inhibition was slower than at 30° and needed longer incubation to produce complete inhibition of tyrosinase activity. Further data on the inhibition by thyroxin revealed that tyrosinase inhibition occurred by two mechanisms: (a) the slow removal of copper in tyrosinase by thyroxin giving rise to inactive tyrosinase, and (b) the inhibition of remaining active tyrosinase by a copper deficient inactivated tyrosinase.

When analogs of thyroxin at 3.0×10^{-5} M were incubated with tyrosinase for 18 hours at 30°, three different responses were obtained: (a) some were inhibitors, (b) some behaved as substrates, and (c) diiodothyronine was inert.

Neocuproine, cyanide and diethyldithiocarbamate are non-competitive inhibitors of mushroom tyrosinase. The last two inhibitors are irreversible inhibitors of tyrosinase. Cuprizone--the specific cupric reagent--is a competitive inhibitor of tyrosinase. Ethylenediaminetetraacetic acid inhibits tyrosinase only after several hours incubation. The inhibition by cuprizone is presumably due to the competition between cuprizone and the substrate of tyrosinase, since the structure of cuprizone resembles the structure of a typical substrate of tyrosinase. Certain other strong copper chelators, however, do not inhibit tyrosinase. Microfilm $2.75; Xerox $5.20. 102 pages.

BIOSYNTHESIS OF LACTOBACILLIC ACID

(Order No. 61-3268)

Teh-yung Liu, Ph.D.
University of Pittsburgh, 1961

Investigation on the relation of biotin and fatty acids in the nutrition of Lactobacillus arabinosus led to the discovery of the cyclopropane derivative lactobacillic acid as a constituent of the lipids of this organism.

The structure of lactobacillic acid was shown to be cis-11,12-methylene-octadecanoic acid by both chemical and x-ray diffraction studies. Thus, the cyclopropane ring of lactobacillic acid occupies the same location in the carbon chain as does the double bond of cis-vaccenic acid. Cis-Vaccenic acid is present in all bacteria known to contain lactobacillic acid.

The metabolic relationship between lactobacillic and cis-vaccenic acid which was discovered in Lactobacillus delbrueckii led Hofmann et. al. to propose in 1957 that the biosynthesis of lactobacillic acid may involve the addition of a one carbon fragment across the double bond of cis-vaccenic acid.

The correctness of this hypothesis has now been established unequivocally by the use of radioactive precursors. When Lactobacillus arabinosus was grown on a medium containing cis-vaccenic acid-1-C^{14}, 18.7% of the radioactive acid was incorporated into the bacterial cells. Of this radioactivity, ninety-nine per cent was located in the fatty acids, and was effectively utilized in the biosynthesis of lactobacillic acid. In experiments using either formate-C^{14} or methionine-methyl-C^{14} as the initial source of radioactivity, the fatty acid fraction of Lactobacillus arabinosus which exhibited by far the highest radioactivity was the one containing lactobacillic acid. The result of degradation studies showed that practically all of the radioactivity incorporated into lactobacillic acid obtained from either formate-C^{14} or methionine-methyl-C^{14} was located in the methylene bridge carbon.

The results of these experiments demonstrated conclusively that the biosynthesis of lactobacillic acid indeed involves the addition of a one-carbon fragment across the double bond of cis-vaccenic acid.

Microfilm $2.75; Xerox $4.60. 88 pages.

ISOLATION AND SOME PROPERTIES OF ALLERGENS FROM TIMOTHY POLLEN

(Order No. 61-3931)

Arthur Malley, Ph.D.
Oregon State University, 1961

Major Professor: Tsoo E. King

By means of ammonium sulfate and ethanol fractionation, a fraction has been isolated from timothy pollen which appears to possess 10,000 times as much biological specific activity as the starting whole pollen extract.

Attempts at further purification using various electrophoretic techniques were unsatisfactory. Further purification has been accomplished using Sephadex column chromatography, and the results suggest that complete isolation can be achieved using longer columns.

The hemagglutination of rabbit red blood cells coupled to timothy pollen extract by diazo bonds was explored as an in vitro assay for timothy allergen during fractionation and purification procedures. It was found that rabbit red blood cells coupled to the fraction of timothy pollen precipitated by 20% saturated ammonium sulfate were agglutinated by sera of patients allergic to timothy pollen, but that this fraction gave very weak skin test reactions. The fraction soluble in 49% but precipitated by 55% saturated ammonium sulfate gave low hemagglutination titers, but strongly positive skin tests. Passive transfer tests indicated that the hemagglutinating factor is distinct from reagin and blocking antibody. The separation of the fraction in timothy pollen producing hemagglutination from the fraction producing the skin reaction indicated that reagin and the antigen in timothy pollen responsible for the skin reaction are not involved in the hemagglutination reaction.

Microfilm $2.75; Xerox $4.20. 79 pages.

THE SEPARATION OF ESTROGENS BY GAS CHROMATOGRAPHY

(Order No. 61-3371)

Horace Feleciano Martin, Ph.D.
Boston University Graduate School, 1961

Major Professor: Herbert H. Wotiz

The prime purpose of this investigation was the development of a rapid and sensitive procedure for the assay of estrogenic hormones. The advent of gas chromatography offered a possible solution to this problem.

A pre-requisite of any gas chromatographic method is that the compounds to be chromatographed be volatile and thermally stable at the temperatures of vaporization and separation in the presence of the eluting gas. Accordingly, the thermal stability of certain free and acetylated estrogens was studied. The results of these studies indicated that decomposition was minimal when small quantities were subjected to gas chromatographic separation. Estrogen acetates were found to be stable up to 340°C by infrared spectroscopy, ultraviolet spectroscopy and by an evaluation of the gas chromatographic peak symmetry.

Once suitable derivatives had been found, the parameters of separation and detection were evaluated. The optimum conditions for separation were found to be: 1) a temperature of 240°-280°C, 2) column length of 3 feet, 3) a silicone grease liquid phase, 4) flow rates of 50-500 cc/min., and 5) non-polar solvents. The lower limits of detector sensitivity were found to be 0.2 μg for a Sr^{90} detector and 100 μg for the thermal conductivity cell detector. The ionization detector responded linearly in the range of 0.2 to 25 μg. The thermal conductivity cell detector responded linearly in the range of 100 to 400 μg.

In order to have a quantitative procedure, it was necessary to determine the optimal conditions for the preparation of the estrogen acetates. It was found by means of gas chromatography, infrared spectroscopy and ultraviolet spectroscopy that estrone was converted to its acetate in 86-90 per cent yield in 2×10^{-3} M solutions in one hour at 65°C. Estradiol, under the same conditions was found to be converted in 92 per cent yield to the diacetate. The remaining 8 per cent was found to be estradiol-3-acetate. By allowing this reaction to proceed overnight only two per cent of the monoacetate was found. Estriol, in reactions which were carried out under similar conditions, was found to be converted in 98 per cent yield to the triacetate.

In order to develop a urinary assay procedure, recovery studies from water and acid hydrolyzed urine, were carried out. The results indicated a 75-80 per cent recovery of estrone and estradiol and a 90-95 per cent recovery of estriol. The lowest concentration studied was the recovery of steroid from a solution containing 1 μg/ml. Studies at this lower concentration showed that the recoveries were independent of concentration.

The method described above has the advantage of chemical specificity, rapidity and reproducibility. As yet, it has not been developed to its highest sensitivity, however, coupled with prepurification procedures and with advances in instrumentation, it appears that the method will become useful for low level estrogen determination in biological media. Microfilm $2.75; Xerox $8.60. 190 pages.

THE EFFECT OF DIETARY PROTEIN ON CAROTENE UTILIZATION

(Order No. 61-3643)

Ratana Suddharatt Newsome, Ph.D.
The Florida State University, 1961

A study of the effect of quantity and quality of dietary protein on carotene utilization, as judged by the liver storage of vitamin A, was made. As a second interest, the effect of varying dietary fat levels was also observed.

Young weanling male albino rats were employed. After two weeks old, they were placed on a diet containing minimum vitamin A for two weeks. At four weeks old, they were placed on eight experimental diets, with varying protein levels and source of 9, 12 and 18 per cent of the diets and varying fat levels of 6, 12 and 24 per cent.

Five diets were designed to simulate the typical dietary pattern of Thailand, where problems of protein malnutrition and vitamin A deficiency have been continuously reported. The other three diets served as controls for comparison.

Casein served as source of animal protein, while rice and soy proteins, as vegetable source. Commercial lard with antioxidant was used as fat source.

Beta carotene was administered to the animals at 0.6 mcg. per gram of body weight per day. The diets were given ad libitum and recorded.

After four weeks on experimental diets, the livers were removed and analyzed individually for vitamin A and fat content. The spectrophotometric method with destructive irradiation technique, to correct for extraneous materials present in the liver solution, was employed for vitamin A determination. The validity of the method was supported by the absorption curves, plotted by the difference in optical density values, before and after irradiation. The curves followed that of vitamin A standard. Eighty-three to one hundred per cent recovery was obtained from the known amount of vitamin A added to the liver samples.

The method of total fat extraction of Folch et. al. ('57) was followed for the fat content of the liver.

The findings were summarized as follows: increased carotene utilization, as judged by greater storage of vitamin A was not seen at higher levels of protein intake. In all cases, animals on mixed protein diets achieved as good storage as those receiving the same levels of animal protein. However, those on low levels of mixed protein stored significantly greater amounts of the vitamin than their counterparts.

Increasing levels of protein intake accelerated the growth rate. Combinations of animal and plant protein achieved significantly better growth than animal protein alone, when fed at the same level. Diet efficiency ratio was similar at both 12 and 18 per cent levels of protein, but slightly lower at the 9 per cent level. Animal protein at the 18 per cent level furnished sufficient amounts of essential amino acids required for growing rats (Rose, '37). Protein at lower levels showed lower amounts of most essential amino acids. Methionine was the most limiting essential amino acid at every protein level except at the 18 per cent casein. Rate of growth and size of the animals were found to influence the vitamin storage.

Varying fat levels did not influence significantly either carotene utilization or fat content in the liver. Animals on high fat level showed great variance in the liver fat content. Increasing fat level also did not affect the growth rate.

Therefore, from the conclusion drawn on the basis of the present work, mixtures of animal and plant proteins would appear to be economically and nutritionally feasible for human feeding in areas with problems similar to those of Southeast Asian countries.

Microfilm $2.75; Xerox $3.60. 64 pages.

AN EPINEPHRINE SENSITIVE LIPOLYTIC ACTIVITY IN ADIPOSE TISSUE

(Order No. Mic 61-1851)

Martin Arthur Rizack, Ph.D.
The Rockefeller Institute, 1960

This dissertation describes the properties of a new lipolytic activity extracted from the rat epididymal fat pad. This enzyme system appears to be responsible for the release of fatty acids from adipose tissue in response to epinephrine and starvation.

It differs in a number of respects from other known lipases of adipose tissue. Its activity is maximal at a pH between 6 and 7, whereas other lipases are most active between pH 8 and 9. The enzyme systems can also be distinguished by marked differences in response to various inhibitors.

Fat pads from starved animals released fatty acids at a faster rate during incubation and yielded more lipolytic activity on extraction than did tissues from fed animals. In their accelerated rate of release of fatty acids and their high yield of lipolytic activity on extraction, fat pads from fed animals incubated with epinephrine resemble the fat pads of starved animals which have not been epinephrine-stimulated.

Most of the lipolytic activity of the fat pad was extractable in sucrose solutions. The yield and state of the enzyme system depended on the prior treatment of the tissue. Fat pads incubated in a phosphate buffer containing 5 mM glucose lost half of their extractable lipolytic activity after 3 hours. Elimination of glucose from the medium increased the rate of release of fatty acids from the tissue and accelerated the rate at which apparent lipolytic activity was lost. Extracts of tissues treated in this manner were found to contain an inactive lipolytic enzyme system which could be activated by incubating these extracts with epinephrine and sediment obtained from the same tissue by centrifuging the homogenate at 12,000 x G. These extracts could also be activated by incubating with ATP, used in place of the tissue sediment, and epinephrine.

The presence in adipose tissue of a lipolytic enzyme system which can be activated and inactivated provides a means whereby the release of fatty acids from adipose tissue can be controlled. The activating effect of epinephrine on this enzyme system is an indication that the mechanism of action of some hormones on adipose tissue may be explained through their regulatory effect on enzyme activity.

Microfilm $2.75; Xerox $3.60. 64 pages.

MEASUREMENT OF DONNAN RATIO BY RADIOACTIVE TRACERS AND ITS APPLICATION TO PROTEIN-ION BINDING

(Order No. 61-3758)

Abraham Saifer, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Joseph Steigman

Previous investigators have concluded that sodium and potassium ions are not bound to serum albumins. In these studies absence of Na^+ ion binding to deionized bovine serum albumin (BSA) was demonstrated by correspondence of Donnan ion ratio distribution between Na^{24} ions with radioactive measurements, and unbound H^+ ions (by pH measurements) in a semipermeable membrane equilibrium dialysis system; by the equality of the I^{131} ratio across the membrane to the reciprocal of the Na^{24} ratio at highly alkaline pH's; and by Na^{24} self-diffusion measurements in BSA solutions as compared to salt solutions.

With the use of a simple equilibrium dialysis system consisting of deionized BSA, HCl of varying concentrations and Na^{24} as the Donnan ion, the molar ratio of $(H^+)_B/(P)$ was obtained from the pH measurements and the Donnan ratio calculated from the ratioactive measurements. From these experimental values, the mean charge on the protein and the $(Cl^-)_B/(P)$ was calculated. At a pH less than 3 the charge, Q, reaches a limiting value of about 66 units, while the $(Cl)_B/(P)$ increases from 11.5 at pH 3.0 to 37.0 at pH 1.55.

Employment of a similar equilibrium dialysis system consisting of deionized BSA or bovine mercaptalbumin (BSM), varying concentrations of NaI, and the radioactive tracers Na^{24} and I^{131}, furnished experimental data which permitted the calculation of intrinsic binding constants for these proteins at isoionic pH. The direct experimental value of $\sum_i N_i k_i$ obtained was 11,524 ± 364 for BSM. Plot of the data $(I^-)_B/(P)$, $\bar{\gamma}$ versus $\bar{\gamma}/\alpha$ where $\alpha = I_F(\mathcal{e}^{-2.303\ w!\ Z_p Z_A})$ is best interpreted as binding to three classes of sites with $n_1 = 1$, $n_2 = 6$ and $n_3 = 14$ and binding constants for each site being: $K_1 = 9200$ and $K_1 = 24\ K_2 = 720\ K_3$. $\sum_i N_i k_i$ calculated from these values is 11,680. These results check closely with the extrapolated values obtained for BSM using EMF measurements. The iodide binding constant obtained for BSA of 7,700 is only about 2/3 of that found for BSM. This may be related to the fact that BSA contains only 2/3 mole of -SH groups per mole of protein whereas BSM contains one mole. No significant differences in the binding constants were obtained for protein concentration variation between 0.5 to 5.0 g%. Similarly, variations in the amounts of radioactive tracer activity over a 20-fold range, or substitution of KI for NaI, produced no appreciable changes in the Donnan ratio values. Identity of Donnan ratio values of K^+ ions (as K^{42}) and Na^+ ions (as Na^{22}) for BSA over pH range from 1.3 to 12.2 show that K^+ ions also do not bind to BSA.

To evaluate quantitatively the competitive effect of buffer ions on binding of iodide ions to BSA, various ionic strength acetate buffer solutions at iso-ionic pH, i.e., 5.25 ± .04, were added to the equilibrium dialysis system. Data obtained show that increasing ionic strength of acetate ion from 10^{-4} M to 10^{-1} M produces a 50-fold decrease in the binding constant, i.e., from 9,750 to 210. Calculation of the acetate ion binding constant for BSA gave a value of about 525.

While the method has been applied to a few well-characterized water-soluble proteins, i.e., the albumins, and the binding studies limited to a few ions, e.g., potassium, acetate, chloride and iodide, in order to establish its validity, it should be applicable to the investigation of the binding of other radioactive ions of high specific activity to "purified" proteins or to other macromolecules.

Microfilm $2.75; Xerox $9.00. 196 pages.

THE CHOLESTEROL OXIDASE SYSTEM: A STUDY OF ITS SUBSTRATE SPECIFICITY AND SOME POSSIBLE EARLY INTERMEDIATES.

(Order No. 61-3562)

Irone Edmund Stevenson, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Ezra Staple

The cholesterol oxidase system is an enzyme system found in mammalian liver mitochondria. It will cleave the side chain of cholesterol in such a way as to convert the terminal methyl groups to CO_2. Thus, when fortified washed mitochondria from rat liver are incubated with 26-C^{14}-cholesterol, $C^{14}O_2$ formation can be taken as a measure of activity of the system. Although there is some speculation that the enzyme system may convert cholesterol to bile acids, its role in the economy of the animal has yet to be definitely clarified. The present research was undertaken to obtain data concerning the substrate specificity of the system and to gain some idea as to possible early intermediates.

Eight simple C_{27} steroids were synthesized, all with C^{14} in the 26-position. These steroids, which differ in the substituents on the A-ring, are: cholesterol, cholestan-3 β-ol, cholestan-3 α-ol, cholestan-3-one, coprostan-3 β-ol, coprostan-3 α-ol, coprostan-3-one and Δ^4-cholesten-3-one. Rates of oxidation of these steroids by the rat liver enzyme system were determined by measuring the $C^{14}O_2$ formation with time. The rate of 26-C^{14}-cholesterol oxidation was used as a reference. The effect of a "pool" of unlabeled cholesterol on the oxidation of the other steroids was determined, as well as the effect of "pools" of the other steroids on the oxidation of 26-C^{14}-cholesterol.

The two best substrates tested (26-C^{14}-coprostanone and Δ^4-cholestenone-26-C^{14}) were found to yield $C^{14}O_2$ at a rapid rate from the beginning of the incubation. However, $C^{14}O_2$ formation from the other steroids proceeded with an initial lag period of 1/2 to 1-1/2 hours, during which little $C^{14}O_2$ was formed. If the amount of $C^{14}O_2$ formed from 26-C^{14}-cholesterol during an 8-hour incubation is assigned a value of 100, the relative amounts of $C^{14}O_2$ formed from the other steroids under the same conditions are: 26-C^{14}-cholestan-3 β-ol, 50; 26-C^{14}-cholestan-3 α-ol, 110; 26-C^{14}-cholestan-3-one, 160; 26-C^{14}-coprostan-3 β-ol, 95; 26-C^{14}-coprostan-3 α-ol, 165; 26-C^{14}-coprostan-3-one, 240; Δ^4-cholesten-3-one-26-C^{14}, 335. Thus, in both the cholestane series and the coprostane series, 3-ketones are better substrates than 3 α-sterols and 3 α-sterols are better substrates than 3 β-sterols. Further, the various members of the coprostane series are better substrates than the corresponding members of the cholestane series.

The oxidation of only one substrate (26-C^{14}-cholestan-3 β-ol) proceeds at a substantially lower rate than the oxidation of 26-C^{14}-cholesterol.

26-C^{14}-cholesterol oxidation is considerably depressed by the presence of "pools" of unlabeled coprostanone and Δ^4-cholestenone, but unlabeled cholesterol "pools" have little effect on the oxidation of these two ketones. The effect of the presence of unlabeled cholesterol on the oxidation of the other, labeled substrates varies with the substrates, but is greatest in the case of 26-C^{14}-cholestan-3 β-ol.

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26-C^{14}-cholesterol can be enzymatically converted to an unsaturated C_{27} 3-ketone that is chromatographically similar to Δ^4-cholestenone. Neither Δ^4-cholestenone itself nor coprostanone was formed from cholesterol in measurable quantities. The cholestenone-like material was shown not to be Δ^5-cholesten-3-one, since this β,γ-unsaturated ketone is unstable under the incubation conditions.

From these data, the conclusion is reached that although the cholesterol oxidase system is not specific for cholesterol alone, the substituents on the A-ring affect the cleavage of the side chain at the other end of the molecule. From a consideration of the structures of the substrates and the readiness with which they are oxidized, it is suggested that a 3-ketone without a 5α-hydrogen is an intermediate in the degradation of cholesterol by the cholesterol oxidase system.

Microfilm $2.75; Xerox $4.00. 74 pages.

CATABOLISM OF 3α,7α,12α-TRIHYDROXY-COPROSTANE BY RAT LIVER MITOCHONDRIA.

(Order No. 61-3563)

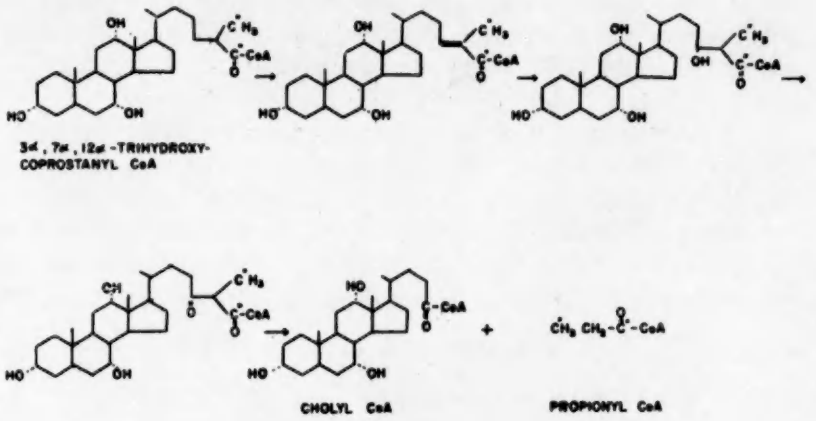
Helga Moeksi Suld, Ph.D.
University of Pennsylvania, 1961

Supervisor: Samuel Gurin

The objective of the present investigation was to study the mechanism of the enzymatic degradation of the cholesterol side chain to the cholic acid side chain. 3α,7α,12α-Trihydroxycoprostane, a compound with cholesterol side chain and cholic acid nucleus, was used in these studies as a substrate.

Rat liver mitochondria, supplemented with 105,000 x g supernatant solution, adenosine-5'-triphosphate, diphosphopyridine nucleotide, nicotinamide, magnesium chloride and sodium citrate, oxidized 3α,7α,12α-trihydroxycoprostane-26,27-C^{14} to 3α,7α,12α,27-tetrahydroxycoprostane and 3α,7α,12α-trihydroxycoprostanic acid. In the absence of diphosphopyridine nucleotide the main product was 3α,7α,12α,27-tetrahydroxycoprostane. Both products were isolated by extensive column and paper chromatography and characterized by infrared spectra and mixed melting points with the authentic samples of 3α,7α,12α-trihydroxycoprostanic acid isolated from alligator bile and tetrahydroxycoprostane obtained by reduction of the above mentioned acid with lithium aluminum hydride. The enzyme system also cleaved the side chain of 3α,7α,12α-trihydroxycoprostane to propionic acid. Addition of carrier potassium propionate to the incubation medium resulted in the incorporation of 21% of the substrate isotope into propionic acid, which was isolated by column chromatography. Two derivatives of the isolated, labeled propionic acid were prepared and recrystallized to constant specific activity. When in addition to the previously mentioned cofactors coenzyme A was added to the incubation medium, 34% of the substrate isotope was recovered in propionic acid. Incubations with 3α,7α,12α,27-tetrahydroxycoprostane-26,27-C^{14} and carrier propionyl coenzyme A afforded labeled propionyl coenzyme A.

The results of the present investigation indicate that both propionyl coenzyme A and cholyl coenzyme A may be formed by thiolytic cleavage of 3α,7α,12α-trihydroxycoprostanyl coenzyme A analogously to the corresponding sequence of reactions involved in the oxidative degradation of α-methylbutyryl coenzyme A.



Microfilm $2.75; Xerox $4.60. 89 pages.

GASTRIC PROTEOLYTIC ENZYMES

(Order No. 61-4505)

Jordan Jien-Nan Tang, Ph.D.
The University of Oklahoma, 1961

Major Professor: Raul E. Trucco

Studies were made on the gastric proteolytic enzymes of the human and several other species of animals. Two proteolytic enzymes were isolated from human gastric juice. One of the enzymes was human pepsin, the other was a new enzyme which was named gastricsin. Further purification resulted in the crystallization of gastricsin. This crystalline enzyme was found to be a homogeneous preparation.

The chemical, physical and enzymatic properties of gastricsin and human pepsin were compared. Gastricsin was found to have a molecular weight of 36,027 compared to 31,390 for human pepsin. The optimal pH of gastricsin was 3.0 and that of human pepsin was 2.0. The two enzymes were also found to differ in electrophoretic mobility, heat stability, milk-clotting activity, proteolytic activity with synthetic peptide and protein substrates, and the effect of urea on their optimal pH's. The terminal amino acid determinations revealed that the two enzymes had different N-terminal amino acid (serine for gastricsin and valine for human pepsin), however, the sequence of the last three amino acids at the C-terminal appeared to be the same (-valyl-leucyl-alanine).

The origin of gastricsin and human pepsin was also studied. Two zymogens were found in the alkaline extract of human gastric mucosa. One of the zymogens, which was a single fraction in both ion-exchange chromatography and electrophoresis, was shown to be activated to both gastricsin and pepsin. The second zymogen was also activated to a proteolytic enzyme which apparently is not present in human gastric juice.

It was found that gastricsin was absent in the gastric preparations of several species of animals. Instead,

several pepsins were found in hog gastric mucosa extract and dog gastric juice. Two possible mechanisms were proposed for the production of these 'heterogeneous systems' of gastric proteolytic enzymes. The biological significances of these 'heterogeneous enzyme systems' were also discussed.

Microfilm $2.75; Xerox $4.80. 95 pages.

FATTY ACID OXIDATION: AN IN VITRO STUDY.

(Order No. 61-3025)

Sidney Sylvan Walkenstein, Ph.D.
Temple University, 1953

HISTORICAL

Beta-Oxidation. Based on the excretion of hippuric acid or phenaceturic acid when omega-phenylated odd-, or even-chain fatty acids, respectively, were fed to dogs, F. Knoop advanced the hypothesis that fatty acids are broken down by a primary attack at the beta-carbon. H. D. Dakin, by showing that the same intermediates appear in the course of oxidation of phenylvaleric acid as appear when phenylpropionic acid is oxidized, proved that fatty acids are degraded stepwise by loss of 2-carbon fragments. Other investigators, using isotopically labelled fatty acids were able to demonstrate that synthesis of higher fatty acids occurs by condensation of a two-carbon intermediate with lower fatty acids, in a reversal of the degradation process.

Omega-Oxidation. Because the omega-oxidized product appeared in the urine of animals fed various branched-chain acids and straight-chain acids from caprylic to lauric the theory was advanced that fatty acids may also be degraded by attack at the omega-carbon. Further investigation showed, however, that although omega-oxidation does occur, it is not a major metabolic pathway.

Fate of the Two-Carbon Fragment. Aside from resynthesis of higher fatty acids, two main pathways for the utilization of the two-carbon fragment were found: formation of ketone bodies and oxidation to carbon dioxide and water via the citric acid cycle. The liver, found to be the sole source of ketone bodies, was shown to convert only short-, even-numbered fatty acids to ketone bodies, but not the short-, odd-numbered fatty acids, or long-chain, even-numbered acids, which, although giving rise to small amounts of acetoacetate were oxidized primarily to carbon dioxide and water. To account for the ketogenicity of the short-, even-chain fatty acids, the hypothesis that two different species of two-carbon fragment arise from the oxidation of fatty acid was advanced. The postulated species were a primary fragment which is active toward oxalacetate, and hence is oxidized via the citric acid cycle to carbon dioxide and water, and a terminal fragment which serves principally as an acetylating agent in the formation of acetoacetate. Coenzyme A was found to be implicated in the breakdown of fatty acids and in the synthesis of acetoacetate.

Although much emphasis has been placed on ketone body formation, it is evident from a survey of the available literature that acetoacetate arises only under abnormal conditions such as diabetes or fasting when carbohydrate oxidation is slight. It is believed that the two-carbon fragment formed during the normal course of fatty acid catabolism enters the Krebs cycle via the intermediary formation of an acetyl-CoA complex which condenses with oxalacetate to form citrate, or the acetoacetyl-CoA complex may itself condense with oxalacetate directly to form citrate.

Structural Requirements. It was found that the structural requirements for fatty acid oxidation varied markedly with the particular experimental conditions which ranged from in vivo, through perfusion and slice experimentation to mitochondrial and various other cell-free preparations. In general the further one proceeds from in vivo experimentation to isolated systems, the less likely is one able to obtain oxidation of the acids not normally considered metabolites, such as phenylated acids, dicarboxylic acids other than succinic and fumaric, branched-chain acids, etc. The effect of increasing chain length of the aliphatic acids is to render them more difficultly oxidizable. Ability to undergo oxidation is apparently independent of the degree of unsaturation.

PRESENT STUDY

Three different aspects of fatty acid oxidation were investigated in the present study. The first was a study of the structural requirements for fatty acid oxidation in washed particulate suspensions of liver. The second was an investigation of aldehyde oxidation in mitochondria of rat tissues. Third, an investigation was made of the mechanism of ketogenesis from short-chain acids in particulate matter of rat liver.

RESULTS AND DISCUSSION

Studies of Structural Requirements. Of the straight-chain fatty acids tested only acetic, propionic and behenic acids failed to cause an increase in the oxygen uptake, and only the short-chain fatty acids of the even series gave rise to appreciable amounts of ketone bodies. Of the dicarboxylic acids only succinic and fumaric acids were readily oxidized. Adipic and glutaric acids showed a small increase in oxygen uptake over endogenous values, whereas pimelic, suberic, azelaic and sebacic acids were not oxidized. However, tetradecandioic acid showed an appreciable oxygen uptake at lower concentrations. All unsaturated, straight-chain, monocarboxylic acids tested were readily oxidized with the exception of cis-2-octadecenoic acid. Of the branched-chain acids only isocaproic and diethylacetic acids were oxidized. None of the phenylated or cyclohexane-substituted acids tested underwent oxidation, and of the keto- and hydroxy-acids tested only pyruvic, citric and alpha-ketoglutaric acids were oxidized, pyruvic giving rise to ketone bodies.

The Active Intermediate. An attempt to simulate the structure of the acyl-CoA complex, postulated as an intermediate in fatty acid oxidation, by synthesis of ethyl thiooctanoate, thereby to obviate the necessity for activation by ATP, was carried out. The results indicated that since the thioester required the presence of ATP for its oxidation, it was hydrolyzed to the free acid prior to activation by ATP.

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Based on recent findings that acetaldehyde oxidation by Clostridium kluyveri results in the formation of acetyl phosphate, the possibility was envisioned that oxidation of an aldehyde by mitochondria of animal tissues might lead to an active fatty acid derivative. In the course of this study it was found that a variety of straight- and branched-chain aldehydes are oxidized by liver mitochondria, and that this oxidation was not due to xanthine dehydrogenase. With the exception of formaldehyde, oxidation of aldehydes was not inhibited by high concentrations. The optimum pH for aldehyde oxidation lay between 7.5 and 7.8. From Duclaux constants on the product of oxidation of acetaldehyde, from oxygen consumption data and from comparisons of rates of ketone body formation from butyraldehyde and octyl aldehyde with their corresponding acids it was found that conversion of aldehydes to ketone bodies was a two-step process involving successive oxidation of the aldehyde and the acid. Although ATP and DPN stimulated oxidation of the aldehyde, neither fumarate nor magnesium ions were required for oxidation of the aldehyde to the acid. It was also found that during the oxidation of acetaldehyde a considerable uptake of inorganic phosphate occurred and this result was interpreted in terms of an oxidation of the aldehyde by DPN coupled to phosphorylation at the pyridine nucleotide level, in a manner similar to that demonstrated for beta-hydroxybutyrate.

Effect of Octanoate on Citric Acid Cycle Oxidations. It was found in this series of experiments that octanoic acid exerted a strongly inhibitory effect on the operation of the citric acid cycle. This inhibitory effect was shown in two ways: first, when octanoate and citric acid cycle component were both available for oxidation by liver mitochondria it was found that no oxidation of the citric acid cycle component occurred until virtually all of the octanoate was converted to ketone bodies; and, second, in isotopic tracer experiments it was shown that very little methylene-labelled succinate underwent oxidation in the presence of unlabelled octanoate, as measured by the activity of the respiratory carbon dioxide, until a large proportion of the octanoate underwent conversion to acetoacetate. On the basis of these experiments the hypothesis was advanced that ketone body formation is caused by recombination of the two-carbon fragments formed during the course of fatty acid oxidation since complete oxidation via the citric acid cycle is prevented by the inhibitory effect of the short-, even-chain fatty acid.

Microfilm $2.75; Xerox $6.40. 134 pages.

CHEMISTRY, INORGANIC

THE DIETHYL ETHER EXTRACTION OF IRON (III) CHLORIDE FROM AQUEOUS ACIDIC LITHIUM CHLORIDE SOLUTION

(Order No. 61-3942)

Carolyn Beane Allen, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Herbert M. Clark

The mechanism of the extraction of iron (III) from aqueous acidic lithium chloride solution by diethyl ether was investigated. At high initial lithium and iron (III) and low initial hydrogen ion concentrations, the extracted species is found to be $LiFeCl_4.4H_2O$. With increasing initial acidity, the lithium ions of the ethereal phase are progressively replaced by hydrogen ions to form the species $HFeCl_4.x(H_2O)$, where x is about three. This replacement appears to take place because it allows the transfer of water molecules to the water-deficient aqueous phase. The lithium to hydrogen ion ratio of the ethereal phase resulting from extraction is never increased over that of the initial aqueous solution.

Three-phase systems were observed in extraction from solutions of iron (III) chloride concentration of less than 0.35 molar and moderate hydrogen and lithium chloride concentrations. It was found that the empirical formula of the extract is not the same in the two ethereal phases of the three-phase systems, that is, the extracted material is a mixture of compounds rather than a single stoichiometric compound. Evidence was found for the extraction of the ion $H(H_2O)_3(Et_2O)^+$ from solutions of high chloride ion concentration. It was found that lithium chloride acts as a salting-out-agent for hydrochloric acid and tetrachloroferric acid and that hydrochloric acid acts as a salting-out agent for lithium tetrachloroferrate in extraction from solutions of moderate ionic concentrations. Thus, the extracted species are probably ion-pairs. The free hydrogen chloride coextracted with tetrachloroferric acid and lithium tetrachloroferrate from solutions of moderate ionic concentration was found to have an empirical hydration number of about three while the coextracted tetrachloroferric acid was found to have an empirical hydration number of five. The $FeCl_4^-$ anion, then, must be dihydrated when extracted. The iron-containing species actually existing in the ethereal phase, however, was shown to be unsolvated $FeCl_4^-$ ion. Thus, the extraction of $FeCl_4(H_2O)_2^-$ is followed by the loss of water molecules from the anion.

The extraction mechanism can be explained by assuming the formation of an etherated hydronium ion as the first step of the extraction process. The three-phase phenomenon is ascribed to the formation of large ion-clusters and their condensation into the heavy phase.

Microfilm $2.80; Xerox $9.70. 214 pages.

PREPARATION AND PROPERTIES OF VINYLHALOBORANES AND VINYLGERMANE AND EXCHANGE REACTIONS OF ORGANOHALOBORANES

(Order No. Mic 60-6776)

Frederick Edward Brinckman, Jr., Ph.D.
Harvard University, 1961

Research Director: F. G. A. Stone

Vinylhaloboranes are conveniently prepared by cleavage of tetravinyltin with boron halides. A number of physical properties of the new vinylhaloboranes is reported, including their vapor pressures and main features of their infrared spectra. Thermal stability of these compounds increases in the sequence $(CH_2{:}CH)_2BF < (CH_2{:}CH)_2BCl < CH_2{:}CHBCl_2 < CH_2{:}CHBF_2$. Modes of decomposition are discussed. The susceptibility of the boron-carbon bond in a number of organohaloboranes to cleavage by water and by ammoniacal silver (I) ion was studied. With the latter reagent vinylhaloboranes react in a manner more similar to arylboron compounds than alkylboron compounds.

A mass spectrometric study has been made of a series of exchange reactions between boron trifluoride and organohaloboranes, RBX_2 or R_2BX (X = Cl, Br). By using boron-10 enriched boron trifluoride in these reactions it was established that the mechanism does not involve rupture of boron-carbon bonds. Mass spectrometric evidence is presented for the existence of transitory intermediate species RB(F)X (X = Cl, Br).

Reduction of vinyltrichlorogermane with lithium aluminum hydride yields vinylgermane, a gas which readily polymerizes to a white solid in daylight. Like polymeric vinylsilane, polyvinylgermane is insoluble in a wide variety of solvents. The infrared spectra of the two polymers resemble each other, suggesting similar structures. Vinylstannane was found to be much less stable than vinylgermane, requiring storage at low temperatures to avoid decomposition, a process which appears to involve more than one route. The infrared spectra of vinylgermane and vinylstannane have been recorded in the gas phase, and are discussed and compared with the spectrum of vinylsilane.

Microfilm $2.75; Xerox $4.80. 91 pages.

NEW ORGANOMETALLIC COMPOUNDS OF THE TRANSITION ELEMENTS

(Order No. Mic 61-2673)

Robert Bruce King, Ph.D.
Harvard University, 1961

Research Director: F. G. A. Stone

The preparation of a series of complexes $CH_3CH{=}CHCH{=}CHR\ Fe(CO)_3$ (R = $-CO_2C_2H_5$, $-CONH_2$, $-COCH_3$, $-CN$, $-CHO$) from $Fe_3(CO)_{12}$ and the corresponding diene is reported. 1,4-Pentadiene and triiron dodecacarbonyl react to give 1,3-pentadiene-iron tricarbonyl. Organotin compounds of the type $R'_xSnR''_{4-x}$ (R', alkyl group; R'', vinyl or phenyl group) react with iron pentacarbonyl in refluxing ethylcyclohexane to give yellow dialkyltin-iron tetracarbonyl dimers, $[R'_2SnFe(CO)_4]_2$.

Reactions between chromium hexacarbonyl and anthracene, phenanthrene, and pyrene have been investigated. Treatment of thianaphthene with chromium hexacarbonyl or triiron dodecacarbonyl, under the appropriate conditions, affords yellow $C_8H_6SCr(CO)_3$ and red-orange $C_8H_6SFe_2(CO)_5$, respectively. Similarly, acenaphthylene reacts with chromium hexacarbonyl to give purple-black $C_{12}H_8Cr(CO)_3$ and with triiron dodecacarbonyl to give $C_{12}H_8[Fe(CO)_3]_2$.

The reaction of cycloheptatriene with cyclopentadienylvanadium tetracarbonyl has been used to prepare purple paramagnetic $C_5H_5VC_7H_7$. Molybdenum and tungsten hexacarbonyls react with 8,9-dihydroindene to give red solids of composition C_9H_{10}-$Mo(CO)_3$[M = Mo, W]. Hydrogenation studies suggest that the molybdenum compound might be cyclononatetraene-molybdenum tricarbonyl.

Perfluoroacyl chlorides react with solutions of $NaMn(CO)_5$ and $NaRe(CO)_5$ in tetrahydrofuran to give perfluoroacyl derivatives of manganese and rhenium of the general formula $R_fCOM(CO)_5$[M = Mn, Re]. By decarbonylating these perfluoroacyl compounds under appropriate conditions, the corresponding perfluoroalkyl compounds, $R_fM(CO)_5$, are obtained. These are the first perfluoroalkyl derivatives of transition elements to be described. Allyl chloride reacts with a solution of $NaMn(CO)_5$ in tetrahydrofuran to give the σ-bonded complex, allylmanganese pentacarbonyl, $CH_2{=}CH{-}CH_2{-}Mn(CO)_5$, which on heating in vacuo loses one molecule of carbon monoxide to give the π-bonded complex, allylmanganese tetracarbonyl, $C_3H_5Mn(CO)_4$. Perfluoroallyl chloride reacts with $NaMn(CO)_5$ to give a crystalline compound $C_3F_5Mn(CO)_5$ shown by F^{19} magnetic resonance to be perfluoropropenylmanganese pentacarbonyl, $CF_3CF{=}CFMn(CO)_5$.

Microfilm $2.75; Xerox $5.80. 117 pages.

NEW DERIVATIVES OF METAL CARBONYLS

(Order No. Mic 60-6773)

Thomas Asbury Manuel, Ph.D.
Harvard University, 1961

Research Director: F. G. A. Stone

The preparation and properties of new π-complexes derived from metal carbonyls are described. The reaction of cycloöctatetraene and iron pentacarbonyl yielded cycloöctatetraene-iron tricarbonyl, cycloöctatetraene-diiron hexacarbonyl, and cycloöctatetraene-diiron heptacarbonyl. The properties of cycloöctatetraene iron tricarbonyl favor a structure in which the hydrocarbon is in a planar configuration, with the iron atom bonded to a delocalized π-orbital of the ligand. The reactions of a variety of π-complexes with triphenyl derivatives of phosphorus, arsenic, and antimony were investigated.

The reaction of a mixture of 1,3,5- and 1,3,6-cycloöctatriene with triiron dodecacarbonyl yielded a cycloöctatriene-iron tricarbonyl and bicyclo(4.2.0)octa-2,4-diene-iron tricarbonyl. Other iron carbonyl complexes of conjugated dienes isolated were isoprene-iron tricarbonyl, α-terpinene-iron tricarbonyl, and alloöcimene-iron

tricarbonyl. Treatment of 1,4-dihydromesitylene with triiron dodecacarbonyl yielded 1,3-dihydromesitylene-iron tricarbonyl. Synthesis of m- and p-divinylbenzene-diiron hexacarbonyls provided the first iron carbonyl derivatives of a benzenoid ring.

The range of metals which form olefin complexes was significantly extended by the preparation of cycloöctadiene-tungsten tetracarbonyl, dimethyldivinylsilane-tungsten tetracarbonyl, and their molybdenum analogs. The very unstable complex cycloöctadiene-iron tricarbonyl was prepared and represents the only known complex of iron with an unconjugated diolefin.

Microfilm $2.75; Xerox $5.20. 105 pages.

THE INTERACTION OF BORON ACIDS AND PHOSPHITE BASES AND THE CONDUCTANCE OF VARIOUS QUATERNARY AMMONIUM SALTS IN ETHYLENE BROMIDE

(Order No. 61-3543)

Edward Francis Moran, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. E. Charles Evers

PART I

A study of the action of the boron acids BF_3 and B_2H_6 on phosphites was conducted. All the reactions were carried out in a standard Stock type high vacuum system.

In the case of the reactions between trialkylphosphites and diborane, stable adducts were formed according to the general equation;

$$2(RO)_3P + B_2H_6 = 2(RO)_3P{\cdot}BH_3.$$

These adducts were stable with respect to hydrolysis and air oxidation. They did not decompose at room temperature. Evidence was presented, however, of their decomposition at higher temperature to form compounds of the type $(RO)_2P{=}BH_2$ and an alcohol.

No stable adduct was formed in the reactions between trialkylphosphites and boron trifluoride. Initial adduct formation was shown to occur at low temperature according to the scheme,

$$(RO)_3P + BF_3 = (RO)_3{\cdot}BF_3.$$

This adduct decomposed, however, on warming to room temperature. Moreover, if excess boron trifluoride was used the trialkylphosphite was found to combine with two equivalents of boron trifluoride per equivalent of phosphite. The product of this reaction consisted primarily of a clear non-volatile liquid. A mixture of gaseous products also resulted along with a white sublimable solid. The non-volatile liquid product was not unequivocally identified, but its composition approached that of a compound with the composition $(RO)_2PBF_4$. This product was soluble only in polar solvents and may have been a mixture. The white solid product was shown to be the trimer $(ROBF_2)_3$. The gaseous product proved to be a mixture of BF_3, PF_3 and a substance which was presumed to be $(BOF)_3$. It has been proposed that the reaction proceeds essentially according to the following equation;

$$(RO)_3P + 2BF_3 = (RO)_2PBF_4 + 1/3(ROBF_2)_3.$$

The other products formed were probably due to various side reactions.

The difference between the behavior of BF_3 and diborane with respect to their action on alkylphosphites is in agreement with their difference in acidic properties. Boron trifluoride forms its most stable complexes with the first atom of each group and borine forms its most stable complexes with the second or a subsequent atom of each group. Thus diborane forms a stable adduct with trialkylphosphites via a phosphorus-boron bond. This bond is stabilized by supplementary π-bonding involving the B-H bond electrons and the vacant 3d-orbitals of phosphorus. Boron trifluoride, on the other hand, being unable to form these supplementary bonds, would be expected to form a more stable bond with oxygen than phosphorus. This behavior has been borne out in this research.

PART II

Conductance measurements were performed on solutions of tetra-n-amylammonium thiocyanate, n-octadecyltri-n-butylammonium nitrate and tetra-n-amylammonium tetraphenylboride in ethylene bromide at 25.00° up to the limit of their solubility. The results conform to those expected for solutions of electrolytes in a solvent with a low dielectric constant. Abnormally high values of the triple ion equilibrium constant for tetra-n-amylammonium tetraphenylboride were obtained. These results were attributed to the lesser degree of solvation of the large tetraphenylboride ion compared to the other ions studied. The tetraphenylboride ion would be expected to be solvated less due to its smaller charge density.

Microfilm $2.75; Xerox $6.40. 133 pages.

THE ROLE OF NICKEL-CARBON MONOXIDE SURFACE COMPLEXES IN THE FORMATION OF NICKEL CARBONYL

(Order No. 61-3897)

Charles Edward O'Neill, Ph.D.
Columbia University, 1961

An experimental study has been made of the interaction of carbon monoxide and nickel metal. This study used gas adsorption and infrared absorption techniques in an effort to explain the marked difference in reaction rate between a well reduced nickel surface and a sulfide activated sample and to possibly provide a mechanism for carbonyl formation in this system.

The samples used in the gas adsorption studies were nickel carbonyl powders. They were placed in a pyrex bulb and glass blown to the adsorption apparatus, cleaned by heating in vacuo at 350°C for a number of hours, and then reduced in hydrogen at the same temperature to remore any surface oxide. After reduction the samples were evacuated at 350°C for thirty minutes and cooled to the desired temperature. The apparatus used for this part of the investigation was similar to those normally used in adsorption experiments.

The samples used in the infrared absorption studies

were nickel metal supported on Cab-o-Sil, a high area silica powder. Samples with an optical "thickness" of 0.025 gms/cm^2 were prepared in a laboratory metallurgical press at 4000 lbs/in^2. These samples were transferred to the "in situ" cell attached to the gas adsorption apparatus, reduced with hydrogen at 350°C, evacuated at 350°C, cooled to ambient temperatures and its infrared absorption measured. Carbon monoxide was then adsorbed and its absorption measured. The infrared spectra were obtained with a Perkin Elmer Model 21 double beam spectrometer. An external mirror system was provided so the samples could be placed at the focus.

The "in situ" cell used in this investigation is a major advance over those previously used. It has magnesium oxide windows, glass blown to a small soft glass cell which could be heated externally to 400°C. The sample holder was also a new design, containing a sealed magnet that permitted the sample to be moved from the path of the infrared beam for direct gas phase analysis.

Known quantities of hydrogen sulfide, oxygen, and ammonia were added to nickel surfaces and their effect on carbon monoxide adsorption measured, both by the resulting adsorption isotherm and by the infrared spectra of the adsorbed molecules. None of the mechanisms found in the literature were supported by the results of this work and a new one is proposed. The formation of nickel carbonyl involves a surface activated complex Ni(CO)* characterized by infrared absorption at 2082 cm^{-1}. This condition is the result of the interaction of the surface with the previously adsorbed molecules and is attained only by those molecules adsorbing near monolayer coverage. On clean nickel, only a small fraction of the surface attains the necessary configuration.

A monolayer of sulfide produces a uniformly active surface characterized by all adsorbed carbon monoxide molecules absorbing at 2082 cm^{-1}. The much larger concentration of these species for the same total area accounts for the marked improvement in the reaction rate. The surface maintains its activity throughout nickel volatilization by remaking sulfide-metal bonds ruptured by the removal of surface nickel atoms.

The formation of nickel carbonyl is believed to involve a reaction between Ni(CO)* with physically adsorbed or dissolved carbon monoxide, depending on the temperature pressure combination used.

Microfilm $2.75; Xerox $7.20. 155 pages.

AQUATION EXCHANGE KINETICS OF SOME RHODIUM COMPLEX COMPOUNDS

(Order No. Mic 61-1066)

William Henry Plumb, Ph.D.
The University of Buffalo, 1961

The specie $Rh(H_2O^{16})_6^{+3}$ was proven to exist in aqueous 0.1 to 3 M. perchloric acid solution at 64.4° C by means of isotopic dilution experiments using H_2O^{18}. The experimental value found was 5.87 ± 0.38 moles of water per mole of rhodium.

The isotopic aquo exchange reaction $Rh(H_2O^{16})_6^{+3} + H_2O^{18} \rightleftharpoons Rh(H_2O^{16})_5(H_2O^{18})^{+3} + H_2O^{16}$ was studied in aqueous 0.1 to 3 M. perchloric acid solution at 64.4° C. The half time of the aquo exchange was approximately 42 hours at 64.4° C. The half time is roughly independent of rhodium concentration in 1 to 3 M. $HClO_4$ solution at 64.4° C. The first order rate constant k_1 was found to be 0.0166 hr.$^{-1}$, where k_1 is defined by the equation $R = k_1(H_2O)_{bound}$.

The activation energy for the $Rh(H_2O)_6^{+3}$ aquo exchange in the temperature range 64° to 79° C was determined to be 32.5 kcal. per mole of $Rh(H_2O)_6^{+3}$. A 1 M. solution of $Rh(H_2O)_6^{+3}$ is stable for 72 hours at 64.4° C and 0.963 M. $HClO_4$ acid concentration. This same solution, however, undergoes considerable change, as shown by its spectrum at 100° C in 24 hours.

An improved method for preparing $Rh(ClO_4)_3 \cdot 6\ H_2O$ from $RhCl_3$ in 75% yield is given. A method for preparing $Rh(ClO_4)_3 \cdot 6\ H_2O$ from waste rhodium solution is also given.

Potassium trisoxalatorhodium monohydrate $K_3Rh(C_2O_4)_3 \cdot 1\ H_2O$ was observed to exchange completely its water at room temperature in less than 20 minutes.

The new hydrate $K_3Rh(C_2O_4)_3 \cdot 2\ H_2O$ not previously reported in the literature was identified by means of aqueous vapor pressure measurements.

Preliminary experiments on the thermal decomposition of $K_3Rh(C_2O_4)_3$ indicated the following stoichiometric equation:

$$2.12\ K_3Rh(C_2O_4)_3 \cdot 4\text{-}1/2\ H_2O - 9.20\ H_2O + 1.08\ Rh_2O_3 + 3.57\ K_2CO_3 + 0.88\ CO + 7.92\ CO_2$$

Microfilm $2.75; Xerox $8.80. 195 pages.

PART I. A POTENTIOMETRIC STUDY OF THE COMPLEXATION REACTION OF SOME SUBSTITUTED BENZENESULFONATE ANIONS WITH CADMIUM (II). PART II. A POTENTIOMETRIC STUDY OF THE EFFECT OF CERTAIN CATIONS ON THE STABILITY OF THE $CdNO_3^+$ COMPLEX ION.

(Order No. 61-3605)

Jack Franklin Tate, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Mark M. Jones

The purpose of Part I has been to determine to what extent some of the quantitative correlations of physical organic chemistry can be adapted to the study of coordination compounds. To achieve this goal an attempt has been made to correlate the stability constants of the cadmium complexes of a large number of substituted benzenesulfonate anions. These compounds are very similar in structure to the substituted benzoic acids whose equilibrium constants and reaction rates have been successfully correlated by means of a Hammett-type linear free energy relationship. Because of this similarity, it was hoped that correlations using the same substituent constants might be obtained using the Hammett-type relationship or more generalized treatments such as that of Branch and Calvin.

For determining these stability constants, Van der Zee's

modification of the fairly precise potentiometric method of Leden was employed. This method is ideally suited for measuring the stability constants of aromatic sulfonates since the free acids are extremely strong. The stability constants of twenty-four sodium salts of substituted benzenesulfonic acids have been determined.

If only inductive effects are considered as in the instances of correlations of aromatic carboxylic acids, a correlation involving a simple Hammett-type relation will not suffice. This is shown by the order of the dissociation constants of some of these ligands, viz.: 2,5-dichlorosulfanilate ~ 4-chloro-m-toluenesulfonate > p-chlorobenzenesulfonate > benzenesulfonate > p-toluenesulfonate.

Such correlations have been apparently found for a considerable number of systems including heterocyclic and aliphatic amine and substituted pyridine complexes of silver (I). However, when these correlations are examined more critically, it is found that the validity or exactness of the correlation varies considerably. In some instances it is necessary to draw several straight lines across a plot of pK_a vs. log of the stability constant. In such cases it is apparent that no simple linear correlation can be valid.

The difference in the stabilities of two related organic ions with cadmium (II) can be expressed as: log K = I + R + H + P + S, where K is the stability constant, I the contribution from polar or inductive effects, R the contribution of differing resonance possibilities, H the purely steric contribution, P the contribution from changes in polarizabilities of the bonds, and S the differences in the interaction involving solvent molecules. The I and R or I + R terms must be much larger than the H or S or H + S to produce a correlation based purely on a change in structure. Unless these rather stringent conditions are met, a simple correlation involving only one structural parameter per substituent will be quite improbable.

The purpose of Part II was to examine the common assumption that within rather wide limits, it is a matter of complete indifference what cation is added along with the coordinating anion in complex formation. This assumption was tested by measuring the stability of the $CdNO_3^+$ complex by Leden's method by the addition of $LiNO_3$, $NaNO_3$, $Mg(NO_3)_2$, $Ca(NO_3)_2$, $Sr(NO_3)_2$, $Al(NO_3)_3$, $Nd(NO_3)_3$, and $La(NO_3)_3$ as titrating solutions. This system was selected for several reasons: (a) it can be examined by a highly precise differential potentiometric method in which the first stability constant is obtained by extrapolation to a condition of zero liquid junction potential, (b) the nitrates required for the titrant solution can be obtained readily in a state of high purity and (c) preliminary studies by Leden indicated that this system had an equilibrium constant of suitable magnitude for precision measurement to within ± 1%. The stability constant for $CdNO_3^+$ was found to vary from 0.1418 using $LiNO_3$ to 1.0629 using $Sr(NO_3)_2$. This ten-fold change in the stability constant demonstrates that the measured stability constant is dependent upon the source of nitrate ion and is smaller the smaller the cation of the added nitrate.

Microfilm $2.75; Xerox $5.60. 115 pages.

THE CHEMISTRY OF SOME NEW INORGANIC DERIVATIVES OF DISILANE

(Order No. 61-3571)

Laird Gordon Lindsay Ward, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Alan G. MacDiarmid

A review of inorganic compounds containing one or more Si-Si bonds has been made. The purpose of the investigation was to attempt the preparation of stable compounds which contained the disilanyl $-SiH_2SiH_3$ group. High vacuum system techniques were employed throughout.

The starting material disilane, Si_2H_6, was prepared from Si_2Cl_6 and $LiAlH_4$ in either tetrahydrofuran, diethyl ether, or di-n-butyl ether. Total recovery of Si as volatile hydrides never exceeded 80% in the most satisfactory medium, di-n-butyl ether (Si_2H_6, 67%, SiH_4, 13%).

Disilanyl iodide, SiH_3SiH_2I, was obtained from the rapid reaction at room temperature of Si_2H_6 with HI in the presence of Al_2I_6 (catalyst) together with hydrogen, and unidentified less volatile, presumably more highly iodinated disilanes.

Disilanyl bromide, SiH_3SiH_2Br, was obtained by passing the vapor of pure SiH_3SiH_2I through a tube containing AgBr.

SiH_3SiH_2I was hydrolyzed instantaneously by pure water giving good yields of bis-disilanyl ether, $(SiH_3SiH_2)_2O$.

Bis-disilanyl sulfide, $(SiH_3SiH_2)_2S$, was obtained by passing the vapor of SiH_3SiH_2I through a tube containing red HgS.

Tris-disilanylamine $(SiH_3SiH_2)_3N$ was obtained from the reaction at room temperature of NH_3 and SiH_3SiH_2I in stoichiometric amounts defined by the equation

$$3SiH_3SiH_2I + 4NH_3 \longrightarrow (SiH_3SiH_2)_3N + 3NH_4I$$

SiH_3SiH_2I and $N(CH_3)_3$ reacted at room temperature and at -78° forming a white solid of approximate composition $SiH_3SiH_2I.(CH_3)_3N_{0.7-0.8}$ which decomposed slightly at room temperature.

The infrared spectra of all the known disilanyl compounds have been recorded. The disilanyl group may be distinguished spectroscopically from the silyl group in analogous compounds by the presence of absorption peaks in the range 760 $cm.^{-1}$ to 880 $cm.^{-1}$, which are not present in silyl compounds.

The physical properties summarized are:

	Iodide	Bromide	Ether	Sulfide	Amine
Vap.Press. log $P_{cm.}$	$\frac{-1767.9}{(273.2+t)}$ + 6.5843	$\frac{-1657.4}{(273.16+t)}$ + 6.7178	$\frac{-1901.1}{(273.2+t)}$ + 7.0472	$\frac{-2487.6}{(273.16+t)}$ + 7.8494	$\frac{-2328.9}{(273.16+t)}$ + 7.0645
B.P.*	102.8	69.5	94.8	143.6	176.1
Trouton's Constant.	21.5	22.1	23.6	27.3	23.7
Molar Ht. Vap'n. Cal./mole	8087	7585	8700	11380	10660
M.P.	-86.1	-97.2	-111.7	-70.4	-97.1

*B.P. °C/76.0 cm. extrapolated from data derived during vapor pressure determinations.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

These disilanyl compounds inflamed spontaneously and exploded upon exposure to the air.

Tris-disilanylamine was the most thermally stable compound of those prepared.

Bis-disilanyl ether was considerably more stable thermally than disilanyl iodide, but it was less stable than disilyl ether.

Disilanyl bromide, when prepared from disilanyl iodide and silver bromide, was found to be stable at 0°. It was most unstable when its vapor was permitted to come into contact with anhydrous aluminum bromide.

Disilanyl bromide was stable at 0° in the presence of small amounts of anhydrous hydrogen bromide.

Microfilm $2.75; Xerox $6.00. 172 pages.

CHEMISTRY, ORGANIC

HOMOCONJUGATE REDUCTION OF SOME DIPHENYLCYCLOPROPENES BY LITHIUM ALUMINUM HYDRIDE. APPROACHES TO A CYCLOPROPENYLCARBINYL CATION.

(Order No. 61-3418)

Robert Seymour Boikess, Ph.D.
Columbia University, 1961

Cyclopropenes are discussed in a critical review which covers the field from the first report of a cyclopropene in 1893 through the present.

A number of substituted diphenylcyclopropenes were treated with lithium aluminum hydride in a standard fashion. The course of the reactions was determined by isolation and independent synthesis of the products, and by quantitative ultraviolet spectroscopic examination of the crude reaction product. When cyclopropanes were obtained as products, they were synthesized by hydrogenation of cyclopropenes and by epimerization with base to the required stereoisomer.

Δ^2-2,3-Diphenylcyclopropenecarboxylic acid and its methyl ester were reduced to $2^t,3^t$-diphenylcyclopropyl carbinol. Δ^2-2,3-Diphenylcyclopropenecarbonyl chloride and Δ^2-2,3-diphenylcyclopropene carboxaldehyde were reduced to Δ^2-2,3-diphenylcyclopropenyl carbinol, which was not reduced further by lithium aluminum hydride under the standard conditions.

A mechanism is proposed to explain the reductions of the carboxylic acid and the methyl ester which involves the stereospecific addition of a complexed aluminum hydride species to the cyclopropenyl double bond, followed by reduction of the carbonyl function. An isotopic labeling experiment was performed to support this scheme. In the case of the acid chloride and the aldehyde, the more reactive carbonyl function was reduced before reduction of the double bond could take place. An explanation involving either nonconjugated activation by the carbonyl function of the cyclopropenyl double bond toward nucleophilic attack, or involving steric crowding in the aluminum hydride complex resulting in a favored conformation with the complexed aluminum hydride proximal to the double bond, is proposed.

Diphenyl Δ^2-2,3-diphenylcyclopropenyl carbinol was reduced to diphenyl $2^t,3^t$-diphenylcyclopropyl carbinol, suggesting that the steric crowding argument is partially operative, although not necessarily crucial. Phenyl Δ^2-2,3-diphenylcyclopropenyl ketone was reduced to phenyl $2^t,3^t$-diphenylcyclopropyl carbinol. Phenyl Δ^2-2,3-diphenylcyclopropenyl carbinol, however, reacted only partially when treated under the standard conditions. Thus, homoconjugate activation of the cyclopropenyl double bond toward nucleophilic attack, possibly through the intermediacy of a non-classical bicyclobutenyl cation, must be the factor which determines whether the double bond becomes saturated.

Δ^2-2,3-Diphenylcyclopropenylcarbinyl acetate was prepared and was found to decompose, without the elimination of acetic acid, in the presence of oxygen. Δ^2-2,3-Diphenylcyclopropenylcarbinyl 3,5-dinitrobenzoate was prepared and was found to be red-orange in color and stable in the presence of oxygen. An attempt to obtain the Δ^2-2,3-diphenylcyclopropenylcarbinyl cation via solvolysis of the 3,5-dinitrobenzoate ester failed. It is shown that the failure is due to some unusual stability of the compound. It is postulated that this stability arises from resonance forms which have intramolecular, interannular p-sigma bonds between the 3,5-dinitrobenzene ring and the cyclopropenyl double bond leading to an intramolecular picrate-type complex.

Treatment of 1,2,3-triphenylcyclopropenyl cyanide with phenyllithium caused it to rearrange to 1,2,3,4-tetraphenylpyrrole, as shown by independent synthesis of the product. The reaction is postulated to proceed by the attack of the nucleophilic negatively charged nitrogen on the cyclopropenyl double bond. Treatment of Δ^2-2,3-diphenylcyclopropenecarbonyl chloride with diphenylcadmium at 60° caused it to rearrange to 2,3,5-triphenylfuran, established by independent synthesis of the product. At 0° the reaction yielded only the expected phenyl ketone, none of which was detected in the 60° reaction. Since the ketone was unchanged on treatment with diphenylcadmium in refluxing benzene (and the acid chloride is thermally stable), the results are explained by an intermediate adduct which rearranges with loss of chloride ion. Thus, the reaction demonstrates the existence of a discreet intermediate in a Grignard-type reaction.

Microfilm $2.75; Xerox $6.80. 141 pages.

SYNTHESIS OF THREE ISOMERS OF LINOLEIC ACID

(Order No. 61-3405)

John Joseph Bruno, Ph.D.
Boston University Graduate School, 1961

Major Professor: Walter J. Gensler

Three skipped unsaturated fatty acids, 8, 11-octadecadienoic acid, 10, 13-octadecadienoic acid and 11, 14-octadecadienoic acid have been synthesized via skipped acetylenic intermediates.

Coupling an ω-chloroacetylenic Grignard derivative I with a propargylic bromide II in tetrahydrofuran in the presence of cuprous chloride catalyst yielded a 1-chloroheptadecadiyne III, which was reduced stereospecifically and selectively to the di-cis - 1-chloroheptadecadiene IV by two treatments with diisobutylaluminum hydride.

$$Cl\text{-}(CH_2)_x\text{-}C{\equiv}C\text{-}MgBr + Br\text{-}CH_2C{\equiv}C\text{-}(CH_2)_y\text{-}CH_3$$

I II

$\downarrow$ CuCl

$$Cl\text{-}(CH_2)_x\text{-}C{\equiv}C\text{-}CH_2\text{-}C{\equiv}C\text{-}(CH_2)_y\text{-}CH_3$$

III

$\downarrow$ 1) (i - Butyl)$_2$AlH 2) (i - Butyl)$_2$AlH

$$Cl\text{-}CH_2)_x\text{-}CH{=}CH\text{-}CH_2\text{-}CH{=}CH\text{-}(CH_2)_y\text{-}CH_3$$

IV

$\downarrow$ 1) Mg, ether 2) CO_2 3) H^+

$$HOOC\text{-}(CH_2)_x\text{-}CH{=}CH\text{-}CH_2\text{-}CH{=}CH\text{-}(CH_2)_yCH_3$$

V

Microfilm $2.75; Xerox $8.40. 181 pages.

OXIDATIVE CLEAVAGE OF SECONDARY ALCOHOLS BY CHROMIC ACID

(Order No. Mic 60-6774)

John Joseph Cawley, Ph.D.
Harvard University, 1961

Research Director: F. H. Westheimer

In a consideration of the mechanism of oxidative cleavage of carbinols by chromic acid, it became necessary to know the mechanism of hydrolysis of acetals derived from tertiary alcohols. Since none of these acetals was known di-t-butyl benzal and di-t-butyl anisal were synthesized from the corresponding dichloride plus potassium t-butoxide, and were characterized by analysis, NMR and IR spectroscopy, and by degradative studies.

These acetals were hydrolyzed in aqueous sulfuric acid-^{18}O and in 86.5% aqueous acetic acid-^{18}O. The t-butyl alcohol so obtained shows no isotopic enrichment; the mechanism of the hydrolysis is therefore known.

The cleavage of phenyl-t-butylcarbinol by chromic acid in 86.5% acetic acid was followed with ^{18}O as tracer. The oxygen of the t-butyl alcohol so obtained had the same isotopic composition as that of the solvent. This result, together with the studies on the mechanism of the hydrolysis of di-t-butyl benzal discussed above, showed that the carbinol is cleaved without prior rearrangement, and that the t-butyl cation is an intermediate in the process.

Further studies of the cleavage process are also reported. Microfilm $2.75; Xerox $6.00. 125 pages.

N,N-DIVINYLANILINE AND ITS POLYMERIZATION

(Order No. 61-3492)

Eugene Yue-Chieh Chang, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Charles C. Price

A difunctional N-vinyl compound, N,N-divinylaniline, was prepared by the exhaustive methylation of N,N-bis-(2-hydroxyethyl)aniline in the following sequence of reactions: bromination with phosphorus tribromide, quaternarization with anhydrous trimethylamine, treatment with silver oxide, and pyrolysis at 150°. The compound is highly sensitive to air, b.p. 81-81.7° (10 mm.), sp. gr. 0.955_4^{20}, n_D^{20} 1.5734.

The free radical copolymerization parameters for N,N-divinylaniline, divinyl sulfone and divinyl ether have been determined by using a modified composition equation of

$$r_2 = \frac{2M_1}{M_2}\left[\frac{m_2}{m_1}\left(\frac{2M_1}{M_2} + r_1\right) - 1\right]$$

where M_1 is the molar concentration of the divinyl monomer. The Q and e values for divinylaniline were estimated by intersection method to be 0.15 and -1.6 respectively, those for divinyl sulfone were 0.14 and +1.4, and those for divinyl ether were 0.04 and -1.3. The higher Q values of these divinyl monomers compared to those of the corresponding mono-vinyl monomers indicated enhanced reactivity due to direct interaction of neighboring double bonds.

The stronger ultraviolet absorption of N,N-divinylaniline compared to that of N-phenylpyrrole also suggested the existence of additional interacting forms of the two vinyl groups in N,N-divinylaniline.

Radical polymerization and copolymerization of N,N-divinylaniline in dilute solutions gave soluble polymers with reduced residual double bond content. An intramolecular-intermolecular cyclization polymerization mechanism similar to that reported by Butler for the polymerization of divinyl ether and divinyl sulfone[1] was proposed.

The presence of a small amount of N,N-divinylaniline in the polymerization of methyl methacrylate or styrene caused a sharp reduction of the molecular weights of the resulting polymers. The chain transfer constants C calculated according to the equation

$$\frac{1}{\bar{P}} = \frac{1}{\bar{P}_o} + C\frac{(S)}{(M)}$$

were 0.034 for methyl methacrylate polymerization and 0.015 for styrene polymerization. A possible mechanism for the chain transfer reaction was postulated and the higher C value in methyl methacrylate polymerization was attributed to polar effects.

1. G. B. Butler, Abstract of April, 1958, ACS Meeting, San Francisco, Calif., p. 6-R; G. B. Butler, Abstract of Sept., 1958, ACS Meeting, Chicago, Ill., p. 32-T.

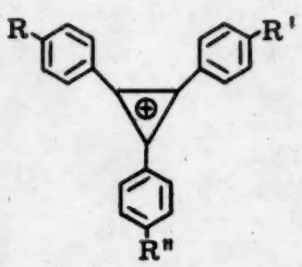
Microfilm $2.75; Xerox $5.20. 102 pages.

THE STABILITY AND REACTION OF SOME CYCLIC CATIONS. PART I. CYCLOPROPENYL CATIONS. PART II. CYCLOPENTADIENYL CATIONS.

(Order No. 61-3421)

Hai Won Chang, Ph.D.
Columbia University, 1961

Studies of synthetic methods of preparing triarylcyclopropenyl cations reveal that phenylchlorocarbene, generated from benzal chloride and an excess of potassium t-butoxide, reacts with tolane to form triphenylcyclopropenyl t-butyl ether, and this is hydrolyzed to bistriphenylcyclopropenyl ether during aqueous washing of the reaction mixture. Neither of these ethers need be isolated because they are converted quantitatively to triphenylcyclopropenyl bromide(I) by treatment with anhydrous hydrogen bromide gas. Using this reaction, diphenyl-p-anisyl-(II), di-p-anisylphenyl-(III), and tri-p-anisyl-(IV) cyclopropenyl cations have been prepared from appropriate combination of 4-methoxytolane, 4,4'-dimethoxytolane, benzal chloride, and anisal chloride.



I. $R = R' = R'' = H$

II. $R = R' = H$; $R'' = OCH_3$

III. $R = H$; $R' = R'' = OCH_3$

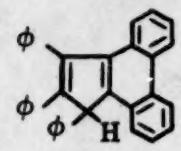
IV. $R = R' = R'' = OCH_3$

The pK_{R^+}'s of I, II, III, and IV were determined spectrophotometrically and could be correlated with both simple MO calculations (using Hückel's approximations) and Streitwieser's "ω method" calculations. An adequate fit of theory to experiment was achieved in both cases by choosing appropriate oxygen parameters.

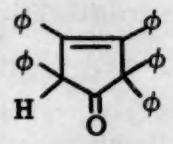
In the course of study of a possible correlation between stabilities of cyclopentadienyl cations and energy predictions of MO theory, it was found that pentaphenylcyclopentadienyl cation, which had been reported to form in the sulfuric acid solution of pentaphenylcyclopentadienol(V) as a deep purple species, is not present. When the sulfuric acid solution of V was poured into ice-water a mixture of products was obtained whose exact composition varies with the strength of the acid and the time of standing, but in a typical run (96% H_2SO_4 for 2 min.) the products were pentaphenylcyclopentadiene(VI)-25%, 1,2,3-triphenyl-1H-cyclopenta(*l*)phenanthrene(VII)-48%, 2,2,3,4,5-pentaphenyl-3-cyclopentene-1-one(VIII)-5%, and an amorphous oxygen-containing material which has not yet been identified-21%.

The visible spectrum observed in sulfuric acid solution of V is the composite spectrum of hydrocarbons VI and VII in sulfuric acid and may be ascribed either to protonation of the hydrocarbons to carbonium ions or to reversible electron abstraction to afford cation radicals. These radicals have been detected by strong ESR signals from the sulfuric acid solutions of V, VI, and VII and considerable line broadening in the n.m.r. .

By contrast, triphenylindenol and 9-phenylfluorenol dissolve in sulfuric acid to afford unrearranged carbonium ions. The pK_{R^+} for the 1,2,3-triphenylindenyl cation is more negative than that for 9-phenylfluorenyl cation, while



VII



VIII

the simple MO calculations predict the reverse, suggesting that non-planarity factors play an important role.

Microfilm $2.75; Xerox $5.00. 100 pages.

CATALYSIS OF ENOLIZATION OF DESOXYBENZOIN BY HALIDE IONS IN ACETIC ACID SOLUTIONS

(Order No. Mic 61-2674)

Ronald Frank Walter Cieciuch, Ph.D.
Harvard University, 1961

Research Director: Professor F. H. Westheimer

To determine the mechanism for catalysis of the enolization of ketones by hydrogen halides, a kinetic study was made of the bromination of desoxybenzoin in 79.9 to 98% acetic acid. HBr and HCl, as well as $HClO_4$, were added as catalysts at concentrations up to 0.300 M.

Rates were determined at 30.15° by following the concentration of bromine spectrophotometrically. Values of the acidity function, H_o, were measured in solutions similar to those used in the kinetic runs.

In these systems the bromination of desoxybenzoin catalyzed by $HClO_4$ is zero-order in bromine, and first-order in desoxybenzoin, h_o, and C_{H_2O}, at constant formal ionic strength. The addition of $LiClO_4$ causes a small decrease in k/h_o.

The bromination proceeds more rapidly with HBr and HCl as catalysts than with comparable concentrations of $HClO_4$; the factors are about 43 and 26 for 0.100 M acid in 98% acetic acid. This superiority decreases markedly in the more aqueous solvents. For the portion of the reaction catalyzed specifically by HBr or HCl the addition of $LiClO_4$ causes a large decrease in k/h_o, but the addition of LiBr or LiCl causes an increase. At constant formal ionic strength the reaction is virtually zero-order in bromine, and first-order in desoxybenzoin, h_o, and stoichiometric concentration of halide ion.

The data for these systems are explained by protonation of desoxybenzoin in a rapid prior equilibrium, followed by rate-determining removal of the α-proton by halide ion, or more slowly in these media by a water molecule. This system provides the first example reported for general acid catalysis with HBr and HCl; its appearance here is attributed to the low concentration of water in these solvents, and to their low dielectric constants. The implications of this finding are further discussed.

Microfilm $2.75; Xerox $8.00. 172 pages.

MONOMERS AND POLYMERS CONTAINING THE TRIFLUOROMETHYL GROUP

(Order No. 61-3748)

Edmund Benjamin Davidson, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: C. G. Overberger

The purpose of this research was to prepare a series of polar monomers; to determine the effect of the proximity of the polar substituent to the double bond on the ability of the monomers to polymerize; to find a heterogeneous catalyst system suitable for their polymerization; to determine the effect of the polar substituent on the properties of the polymers; and to correlate the structure of the polymers with their physical and chemical properties. The monomers prepared in this work were alpha olefins containing the trifluoromethyl group.

3,3,3-Trifluoropropene was prepared from 1,1,1-trifluoro-2-propanol by conversion to and pyrolysis of the acetate. 4,4,4-Trifluoro-1-butene was prepared from 1,1,1,3-tetrachloropropane by fluorination with antimony trifluoridedichloride to give 1,1,1-trifluoro-3-chloropropane. The reaction of formaldehyde with the Grignard reagent derived from this gave the next higher homologous alcohol, which was acetylated and pyrolyzed. 5,5,5-Trifluoro-1-pentene was prepared from 3,3,3-trifluoropropyl-1-magnesium chloride by reaction with α,β-di-bromoethyl ethyl ether followed by debromoethoxylation. 2-Trifluoromethylpropene was prepared from ethyl trifluoroacetate by reaction with methylmagnesium iodide followed by dehydration of the resulting tertiary alcohol over phosphorus pentoxide. 3-Trifluoromethyl-1-butene was prepared from 2-trifluoromethylpropene by addition of hydrogen bromide, reaction of the corresponding Grignard reagent with formaldehyde, acetylation and pyrolysis. 4-Trifluoromethyl-1-pentene was prepared from 2-trifluoromethylpropyl-1-magnesium bromide by reaction with α,β-dibromoethyl ethyl ether followed by debromoethoxylation. Trifluoromethacrylonitrile was prepared from trifluoroacetone by conversion to the cyanohydrin, then to the cyanohydrin acetate followed by pyrolysis. 3-Methyl-3-trifluoromethyl-1-butene could not be prepared from 2,2-dimethyl-3-acetoxybutanoic acid by reaction with sulfur tetrafluoride. 4-Methyl-4-trifluoromethyl-1-pentene could not be prepared from 2,2-dimethylpent-4-eneoic acid by reaction with sulfur tetrafluoride. 2-Trifluoromethylpropane was prepared by hydrogenation of 2-trifluoromethylpropene or by reaction of sulfur tetrafluoride with isobutyric acid. 4-Methyl-4-trifluoromethyl-1-pentene could not be obtained from this by alkylation with allyl chloride.

3,3,3-Trifluoropropene could not be polymerized with catalysts such as triisobutylaluminum - titanium tetrachloride or triisobutylaluminum-vanadium trichloride. 4,4,4-Trifluoro-1-butene was polymerized with a vanadium trichloride-triisobutylaluminum catalyst to give a polymer, m.p. 263°. Catalysts prepared from titanium trichloride-triisobutylaluminum, titanium tetrachloride-triisobutylaluminum, titanium tetrachloride-diethylzinc, vanadium trichloride-diethylzinc, vanadium oxytrifluoride-triisobutyl aluminum, vanadium tetrachloride-triisobutylaluminum, and titanium tetrachloride-triethyl boron were not effective. 5,5,5-Trifluoro-1-pentene was polymerized with a vanadium trichloride-triisobutylaluminum catalyst to give a polymer, m.p. 225°. 2-Trifluoromethylpropene could not be polymerized with lithium in ammonia or n-butyllithium. 3-Trifluoromethyl-1-butene and 4-trifluoromethyl-1-pentene were polymerized with a vanadium trichloride-triisobutylaluminum catalyst to give polymers with m.ps., dec. 300° and 253°, respectively. Trifluoromethacrylonitrile was polymerized with organic and inorganic bases.

In summary, a series of polar monomers were prepared. It was found that the presence of the trifluoromethyl group on the double bond suppressed polymerization, but that monomers bearing the group on the carbon atom alpha to the double bond were polymerizable. Of the numerous catalysts employed, only the vanadium trichloride - triisobutylaluminum system was active. The polymers obtained were crystalline and showed an increase in melting point over their hydrocarbon analog. The polymers were not soluble in solvents.

Microfilm $2.75; Xerox $4.40. 84 pages.

PREPARATION AND PYROLYSIS OF ACYLOXY DERIVATIVES OF METHYL AND ETHYL LACTATE

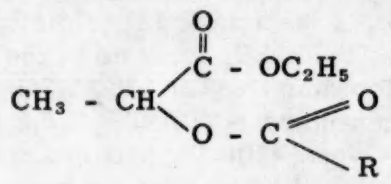
(Order No. 61-3500)

Joseph Di Pietro, Ph.D.
University of Pennsylvania, 1961

Supervisor: Allan R. Day

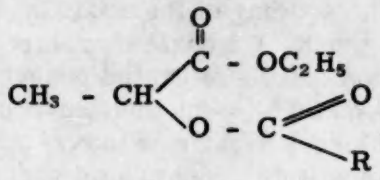
The object of this work was to investigate the thermal decomposition of acyloxy derivatives of methyl and ethyl lactate. It was of considerable interest to study what effect electronegative and electropositive groups would play in influencing the ease of the elimination reaction. It was also recognized that this pyrolytic process might introduce a convenient method of preparation for ethyl and methyl acrylate. The possibility was introduced to investigate the effect of solvents, having a high dielectric constant, and the catalytic effect of several packing materials on the nature and yield of the products.

The preparation of the aliphatic acyloxy derivatives of ethyl lactate, with the general formula



where (R) equaled $-CH_3$, $-OCH_3$, H, $-CH_2CH_3$, $-CH_2CH_2CH_3$, $-CH_2CH-(CH_3)_2$ $-CH_2Cl$, $-CHCl_2$, $-CCl_3$ and $-C_7H_7$, was accomplished in yields ranging between 65 and 89 per cent. The pyrolyses of these compounds at 450° yielded ethyl acrylate and the corresponding carboxylic acids. The per cent pyrolysis varied from 34.7 for the isovaleroxy to 85.5 for the chloroacetoxy derivative. If the temperature of pyrolysis was 500°, in addition to ethyl acrylate, ethylene was also obtained. An attempt was made to correlate the per cent pyrolysis with the ionization constants of the acid related to the acyl group of the ester and with the C = O stretching band in the infrared spectra of the compounds.

The preparation of the aromatic acyloxy derivatives of ethyl and methyl lactate, with the general formula



where (R) equaled phenyl, o-methoxyphenyl, o-chlorophenyl, o-nitrophenyl, p-methoxyphenyl, p-methylphenyl, m-nitrophenyl, m-bromophenyl, 2,4,6-trimethylphenyl and p-t.-butylphenyl, was accomplished in yields ranging between 51 and 90 per cent. The pyrolyses of these compounds at 450° and at 444°, with Pyrex glass as the contact material and at two different contact times, as determined by the nitrogen rate passing through the system, varied from 36.9 per cent for the unsubstituted derivative to 76.0 per cent for the 2,4-dichlorobenzoxy derivative. In all instances ethyl or methyl acrylate and the corresponding aromatic acid were the major products of pyrolysis. The method of analysis used was standardized with known mixtures in order to determine its validity and reproducibility.

An attempt was made to determine the effect of various packing materials on the pyrolysis of the unsubstituted benzoxy derivative.

It was found that the 2,4-dichloro, the p-t.-butyl, the m-methyl, the o-methoxy, the o-bromo, the p-chloro and the p-methoxy derivatives gave the highest yields of acrylate.

A correlation between the per cent pyrolysis of the esters and the ionization constants of the acids related to the acyl group of the esters did not provide a straight line relationship, as was expected. A more satisfactory correlation was obtained when the per cent pyrolysis of the esters was related to the C = O stretching band of the infrared spectra or to the $\Delta_{\gamma(b)}$, C - H bend in plane. If the logarithm of the per cent pyrolysis of the substituted esters divided by the per cent pyrolysis of the unsubstituted benzoxy compound, log P/Po, or the per cent pyrolysis was plotted versus the σ_p and σ_m values of the acids related to the acyl group of the esters, a straight line was obtained.

It was also of considerable interest to study the aromatic derivatives from infrared observations and from molecular models in order to establish the effect of structure on the pyrolytic behavior.

It is suggested that the effect of changes in the acid portion of esters on the pyrolysis is more pronounced in the aliphatic than in the aromatic series; in the latter it is possible that the steric, the resonance and the inductive effects of the substituents in the aromatic nucleus play a more important role in the extent and ease of pyrolysis.

Microfilm $2.75; Xerox $6.00. 123 pages.

STUDIES ON THE REACTIVITY OF POLYMERIC THIOL GROUPS

(Order No. 61-3749)

John J. Ferraro, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Dr. C. G. Overberger

The activity of many enzymes has been shown to depend on the presence of sulfhydryl groups, not all of which are of equal reactivity nor of equal importance for the proper functioning of the enzymes. Three types of sulfhydryl groups are recognized depending of their reactivity with oxidizing, alkylating and mercaptide-forming reagents. These sulfhydryl groups are classified as freely reactive, sluggishly reactive and "masked"; the activity of the third appears only when the protein enzyme is denatured and unfolding of the polypeptide chain makes these sulfhydryl groups available.

Ease of oxidation of a sulfhydryl group has been related to the ease of dimerization of two initially formed thiyl radicals to form a disulfide bond. Oxidation of polymeric thiol groups therefore might be expected to be hindered because of the decreased mobility and diffusibility of a thiyl radical attached to a polymeric chain. The determination of the extent to which the activity of these sulfhydryl groups is affected by the restraints of a carbon-carbon polymeric chain was one of the purposes of this investigation.

Another purpose of this study was to point out practical possibilities of improving the effectiveness of chemical protection against physiological damage by radiation. Cysteine, glutathione and other simple sulfhydryl compounds have been long known to be efficient detoxifying agents for the oxidizing radicals produced by X-ray irradiation of water containing dissolved oxygen. A polymeric sulfhydryl compound might also be expected to be an efficient detoxifying agent and in addition would possess an increased period of efficiency in the animal body by not being voided as easily as monomeric compounds. Preliminary testing of these synthetic sulfhydryl polymers has indicated their general efficiency as chemical protection against damage by radiation but not their desired permanency.

From these considerations, sulfhydryl polymers might be expected to exhibit some properties of enzymes and might therefore be profitably investigated as models. For this purpose, sulfhydryl polymers were prepared by saponifying the homopolymers of vinyl thiolacetate and the copolymer of vinyl thiolacetate and methyl methacrylate. The saponified homopolymer was found to be soluble in dimethyl formamide and a method for assaying the sulfhydryl content in solution was developed by the non-aqueous potentiometric titration of the hydrogen chloride released when a solution of the homopolymer was allowed to come in contact with a pyridine solution of mercuric chloride. The sulfhydryl content of aqueous solutions of the saponified copolymer was determined by the spectrophotometric titration with the mercaptide forming reagent p-chloromercuribenzoic acid.

A comparison was made of the relative ease of oxidizability of these polymeric sulfhydryl groups and those of monomeric thiol compounds of similarly constituted environment. These were 2,2-dimethyl-4-mercaptovaleric

acid, a new compound representing a chain segment of the saponified copolymer of vinyl thiolacetate and methyl methacrylate, and 2,2-dimethyl-4-(p-mercaptophenyl)-valeric acid, a new compound representing a chain segment of the saponified copolymer of p-vinylphenyl thiolacetate and methyl methacrylate, whose oxidizability had been described previously. 2-Mercaptoethanol, 2,4-pentanedithiol, and 2,5-hexanedithiol, whose oxidizabilities were described before, served as model compounds for the ease of oxidation of the saponified homopolymer of vinyl thiolacetate.

Comparative ease of oxidizability of the monomeric and polymeric thiol groups were examined on the basis of the spectrophotometrically followed rate of reduction of a dye, sodium 2,6-dichlorobenzenoneindophenol. It was found that oxidation was most rapid when intramolecular disulfide formation was facile. Thus the saponified homopolymer of vinyl thiolacetate oxidized 24.5 times faster than the saponified homopolymer of p-vinylphenyl thiolacetate. The saponified homopolymer of vinyl thiolacetate also oxidized almost 50 times faster than β-mercaptoethanol and almost 10 times faster than its model 2,4-pentanedithiol.

It was also found that 2,2-dimethyl-4-(p-mercaptophenyl)valeric acid oxidized about 1/3 as fast as the saponified copolymer of p-vinylphenyl thiolacetate and methyl methacrylate, while 2,2-dimethyl-4-mercaptovaleric acid oxidized slightly faster than the saponified copolymer of vinyl thiolacetate and methyl methacrylate.

Suggestions to explain the above data have been made. The slow rate of oxidation of saponified poly(vinylphenyl thiolacetate) compared to saponified poly(vinyl thiolacetate) has been ascribed to the increased steric requirement for the intramolecular dimerization of phenyl thiyl radicals along a carbon chain, viz. in poly p-mercaptostyrene, compared to thiyl radicals directly attached to the polymer backbone, viz. in poly vinyl mercaptan.

The oxidation products of 2,4-(p-mercaptophenyl)-pentane and 2,4-pentanedithiol, models of poly p-mercaptostyrene and poly vinyl mercaptan, respectively, have been examined and can best be described as equilibrium mixtures of polymeric and monomeric disulfides whose position of equilibrium depends on temperature as well as other factors.

Microfilm $2.75; Xerox $4.20. 79 pages.

INTRAMOLECULAR CARBOXYLATE ATTACK ON ESTER GROUPS

(Order No. Mic 61-1046)

Erick Charles Gaetjens, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Herbert Morawetz

The anions of phenyl acid succinates and phenyl acid glutarates are hydrolyzed at an unusually fast rate in the intermediate pH region (3-8). This reaction involves the nucleophilic attack of the neighboring ionized carboxyl group on the carbonyl carbon atom of the ester function to form an intermediate anhydride which is, in turn, rapidly attacked by water. The aim of this investigation was to compare substituent effects in these intramolecular to similar intermolecular reactions, e.g., the acetate ion catalyzed hydrolysis of phenyl acetates, and to assess the importance of the spacing of the attacking carboxylate from the ester group. We have, therefore, measured the rate of hydrolysis of 10 substituted phenyl acid glutarates (p-methoxy-, p-methyl-, o-methyl-, p-bromo-, o-bromo-, p-chloro-, o-chloro-, p-carbomethoxy-, m-nitro, and p-nitro-) of 7 substituted phenyl acid succinates (p-methoxy-, o-methoxy, p-hydroxy-, o-hydroxy-, p-acetamido-, o-acetamido-, p-chloro-), as well as of copolymers of methacrylic acid containing up to 3 mole% of p-nitrophenyl methacrylate acrylate, and p-methoxyphenyl methacrylate. The progress of the reaction was followed by the appearance of the UV absorption of the corresponding phenol. The main conclusions were:

(1) The rates were found to be unusually sensitive to electron-withdrawing para phenyl substituents. Thus the rates of the intramolecular hydrolysis of p-nitrophenyl acid glutarate and phenyl acid glutarate differed by a factor of 540. In contrast, the hydroxide ion catalyzed hydrolysis of p-nitrophenyl acetate and phenyl acetate differed only by a factor of 14, the acetate ion catalyzed hydrolysis of p-nitrophenyl acetate and phenyl acetate by a factor of 15, and the hydroxide ion catalyzed hydrolysis of p-nitrophenyl acid glutarate and phenyl acid glutarate by a factor of 13.

(2) The large substituent effect on the reaction rates was found to be due to a change in the entropies of activation, the enthalpies of activation remaining largely unaffected. Since the ionization constants of substituted phenols have a very similar substituent sensitivity and electron-withdrawing substituents exert here their effect also by modifying the entropy of ionization, it was postulated that the intramolecular reaction has a transition state in which the phenoxide is largely ionized. Thus, the intramolecular reaction might involve direct displacement of the phenoxide by the carboxylate, while the intermolecular reaction leads through a tetrahedrally bonded intermediate.

o-Carbomethoxy and o-methyl substituted succinates and glutarates react at a slower rate than the corresponding para substituted esters, presumably because of an increase in non-bonded interaction in the transition state. On the other hand, o-chloro, o-bromo-o-methoxy, o-hydroxy, and o-acetamido substituted esters react at higher rates than the corresponding para substituted esters; this observation is interpreted in terms of a field effect involving the interaction of a charged nucleophile with a polarizable ortho substituent as postulated by Bunnett.

The hydrolysis of the copolymers behaved in an interesting manner, indicating that about 20% of the ester groups reacted at a rate 10 times faster than the remaining 80% of the ester groups. This phenomenon has been interpreted as reflecting the stereochemical arrangement of the reacting groups in the immediate neighborhood of the ester groups.

To define the importance of stereochemical isomerism on ester attack by a neighboring carboxylate, α,α' dimethyl-succinic acid mono(p-acetamidophenyl) ester was prepared in both the meso and the racemic form. The intramolecular reaction of these two esters had rates differing by less than 10%. The rates were 10 times higher than that of the corresponding unsubstituted succinic ester and had significantly lower activation energies.

Microfilm $2.75; Xerox $7.00. 147 pages.

THE ACID-CATALYZED REARRANGEMENTS OF 2,2-DIALKYL-1,3-PROPANEDIOLS.

(Order No. 61-3751)

Harold M. Gladstone, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: F. M. Beringer

The purpose of this research was to investigate the action of hot dilute sulfuric acid on 1,3-propanediols in which the 2-carbon is incorporated in a carbocyclic ring or symmetrically substituted with simple alkyl groups.

The major product observed from each dehydration-rearrangement was an aldehyde, free or incorporated in an acetal, with a rearranged carbon skeleton resulting from a 1,2-migration of a methyl, ethyl or ring methylene group. For the cyclic compounds this resulted in an overall ring expansion to the next larger carbocyclic ring. Minor products included ketones, olefins and epoxides.

Rates of formation of products from the 1,3-diols were roughly measured by the rate at which water-insoluble organic products were collected by continuous steam distillation through an inverse Dean-Stark trap. Relative rates depended on the 2,2-substituents as follows: $(CH_3)_2$, 1; $(CH_3CH_2)_2$, 3.5 ± 1; $(CH_2)_5$, 5.5 ± 1; $(CH_2)_4$, 80 ± 4; $(CH_2)_3$, 550 ± 50; $(CH_2)_2$, 2000 ± 300. Under the same conditions the reactions of 1-hydroxymethylcyclopentanol and 1-hydroxymethylcyclohexanol were immeasurably fast.

Both 1,1-bis(hydroxymethyl)-cyclobutane and 1-hydroxymethylcyclopentanol were shown to yield exclusively cyclopentanecarboxaldehyde under identical conditions. Similarly, 1,1-bis(hydroxymethyl)-cyclopentane and 1-hydroxymethylcyclohexanol were shown to yield identical product mixtures consisting mainly of cyclohexanecarboxaldehyde and 2-methylcyclohexanone.

It was concluded that the reactive intermediates in acid-catalyzed rearrangements of 1,3-diols and related 1,2-diols were identical.

Microfilm $2.75; Xerox $5.40. 106 pages.

SYNTHESIS OF BENZIMIDAZOLYLMETHYL ANALOGS OF VITAMIN B_1 AND BENZIMIDAZOLYLMETHYL DERIVATIVES OF ETHYL 4-AMINOSALICYLATE

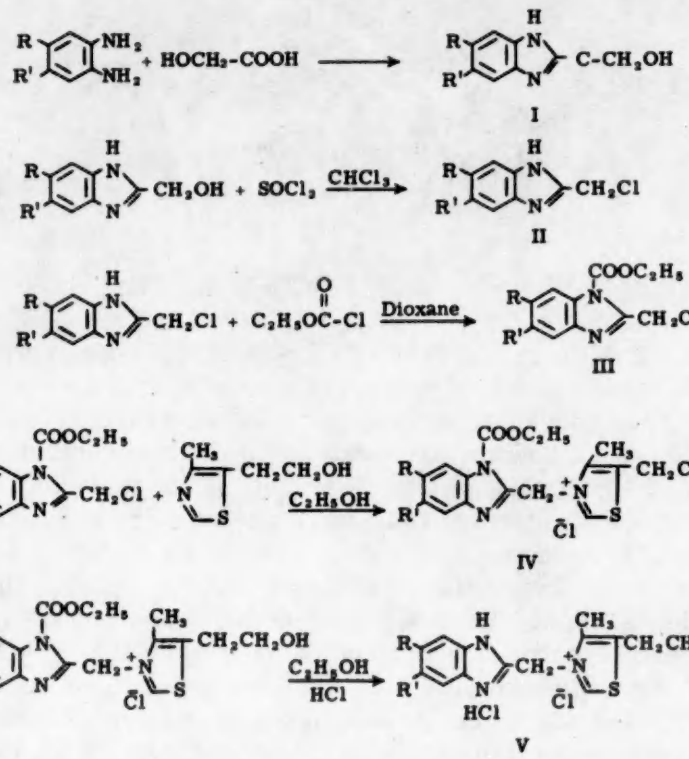
(Order No. 61-3516)

Anthony Michael Grimaldi, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Allan R. Day

The main objectives of this investigation were the syntheses of benzimidazolylmethyl analogs of Vitamin B_1 as potential thiamine antagonists, as well as the syntheses of benzimidazolylmethyl derivatives of ethyl 4-aminosalicylate as potential anti-tubercular drugs.

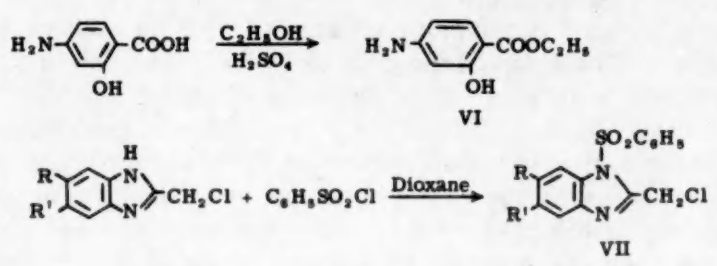
The synthesis of the thiamine analogs can be divided into five steps: (1) preparation of 2-hydroxymethylbenzimidazoles; (2) preparation of 2-chloromethylbenzimidazoles; (3) preparation of 1-carbethoxy-2-chloromethylbenzimidazoles; (4) condensation of the 1-carbethoxy-2-chloromethylbenzimidazoles with 4-methyl-5-β-hydroxyethylthiazole; (5) removal of the carbethoxy group:



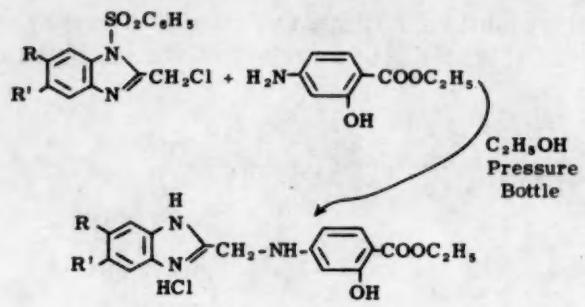
R=H, R'=H: R=H, R'=Cl; R=H, R'=CH_3; R=H, R'=CH_3O; R=H, R'=$COOC_2H_5$ and R=R'=CH_3

The hydroxy compounds (I) were prepared by Phillip's method except where R=H and R'=$COOC_2H_5$. In this case a fusion method proved successful. The hydroxy compounds were converted to the corresponding chloro compounds (II) by heating with thionyl chloride in chloroform. The 1-carbethoxy-2-chloromethylbenzimidazoles (III) were prepared by the reaction of two moles of the chloro compound with one mole of ethylchloroformate in anhydrous dioxane. The quaternization of III with 4-methyl-5-β-hydroxyethylthiazole in absolute ethanol produced 1-carbethoxy-2-benzimidazolylmethyl-(4-methyl-5-β-hydroxyethyl)-thiazolium chlorides (IV). The carbethoxy group was removed by refluxing IV in absolute ethanol which previously had been saturated with anhydrous hydrogen chloride to produce the desired analogs, 2-benzimidazolylmethyl-(4-methyl-5-β-hydroxyethyl)-thiazolium chloride hydrochloride (V). The removal of the carbethoxy group has been verified by infrared spectra and analyses.

The synthesis of the benzimidazolylmethyl derivatives of ethyl 4-aminosalicylate can be divided into three steps: (1) preparation of ethyl 4-aminosalicylate; (2) preparation of 1-benzenesulfonyl-2-chloromethylbenzimidazoles; (3) condensation of 1-benzenesulfonyl-2-chloromethylbenzimidazoles with ethyl 4-aminosalicylate:



The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.



VIII

R=R'=H; R=H, R'=Cl; R=R'=CH_3

Ethyl 4-aminosalicylate (VI) was prepared by refluxing 4-aminosalicylic acid in absolute ethanol with a small amount of concentrated sulfuric acid, neutralizing the reaction with a sodium carbonate solution, and removing the product by filtration. The 1-benzenesulfonyl-2-chloromethylbenzimidazoles (VII) were prepared by reacting one mole of benzenesulfonyl chloride with two moles of 2-chloromethylbenzimidazole in anhydrous dioxane. The condensation of VI and VII in absolute ethanol by means of a pressure bottle produce the desired derivatives, ethyl 4-(2-benzimidazolylmethylamino)-salicylate hydrochloride (VIII). The use of the pressure bottle in the condensation removed the benzenesulfonyl blocking group during the course of the reaction. This has been verified by infrared spectra and analyses.

The objective of this investigation were brought to a successful completion by using two new blocked chloromethylbenzimidazoles.

Microfilm $2.75; Xerox $5.00. 99 pages.

HYDROLYSIS OF SOME ESTERS OF PHOSPHORIC ACID IN WATER ENRICHED IN OXYGEN-18

(Order No. Mic 60-6775)

Paul Charles Haake, Ph.D.
Harvard University, 1961

Research Director: F. H. Westheimer

Ethylene phosphate had previously been shown to hydrolyse 10^7 times faster than dimethyl phosphate in either acid or alkali. Hydrolysis of these esters in water enriched in ^{18}O has now shown that ethylene phosphate hydrolyses with at least 99.7% phosphorus-oxygen cleavage but dimethyl phosphate hydrolyses with more than 85% carbon-oxygen cleavage. The ratio of rates of attack at phosphorus is therefore about 10^8.

Furthermore, the acid catalysed hydrolysis of ethylene hydrogen phosphate in water enriched in ^{18}O is accompanied by acid catalysed exchange of ^{18}O into unreacted diester. The ratio of the rate of hydrolysis to the rate of exchange is about 5. This ratio for dimethyl hydrogen phosphate is about 20 and for methyl dihydrogen phosphate is about 5 in acid under somewhat different conditions. Therefore, both the rate of exchange and the rate of hydrolysis in the cyclic ester have been accelerated, relative to the open chain ester, by a factor of about 10^8. These facts have been used as the basis for an argument that the activated complex for acid hydrolysis of these phosphate esters cannot have the usual configuration for S_N2 displacement reactions. An activated complex with the geometry of a trigonal bipyramid or a square pyramid is in accord with the experimental evidence.

It was also found that the uncatalysed hydrolysis of dimethyl hydrogen phosphate is accompanied by exchange of oxygen atoms with the solvent, providing evidence for the presence of a pentacovalent intermediate in this reaction. Microfilm $2.75; Xerox $5.60. 114 pages.

THE CHEMICAL COMPOSITION OF THE EXTRACTIVES FROM THE NEWLY FORMED INNER BARK OF DOUGLAS FIR, PSEUDOTSUGA MENZIESII (MIRB.) FRANCO.

(Order No. 61-3924)

George William Holmes, Ph.D.
Oregon State University, 1961

Major Professor: E. F. Kurth

The aqueous methanol extracts of the newly formed inner bark, mature inner bark and outer bark of several Douglas fir trees were examined. The extracts were separated into hexane solubles, ether solubles and water solubles by liquid-liquid extraction, and a methanol soluble fraction was obtained by filtering the water soluble fraction through Celite and extracting the air-dry Celite pad with methanol.

A small amount of phytosterol was isolated from the newly formed inner bark hexane solubles by alumina column chromatography, although a major part of the hexane solubles (93%) was saponifiable. An attempted crystallization of the hexane solubles from acetone gave a brown oil which appeared to contain a high molecular weight aliphatic acid or ester.

The ether solubles from the newly formed inner bark and mature inner bark were crystallized to yield d-catechin. Paper chromatography and infrared spectroscopy indicated the presence of l-epicatechin in these fractions also. The mature inner bark ether solubles also contained a very small amount of d-dihydroquercetin, while the ether soluble fraction from the outer bark was essentially all d-dihydroquercetin. No catechins were evident in the outer bark ether solubles.

The methanol solubles contained a relatively large amount of ash and appeared to be very similar to the water soluble, phenolic materials. No further work was done with this fraction.

The water solubles from the newly formed inner bark were separated into bases, acids and neutrals by ion exchange resins. The basic fraction contained the following amino acids: aspartic acid, glutamic acid, serine, proline, glycine, alanine, threonine, valine, leucine and isoleucine. The aromatic amino acids, phenylalanine and tyrosine, may also have been present.

The acidic fraction of the water solubles did not appear to contain uronic acids or any common aliphatic acids. Shikimic and quinic acids were present along with six other unidentified substances which were also evidently hydroaromatic substances.

The neutral fraction contained a small amount of an ether soluble substance which gave a positive Wiesner's (phloroglucinol-hydrochloric acid) test. This substance was not a β-glucoside but was decomposed by an attempted acidic hydrolysis. Glucose and arabinose may have been present in this complex hydrolysate.

The newly formed inner bark water solubles contained up to 29 per cent simple sugars in mid-summer. Sucrose, glucose, fructose and raffinose were found in this fraction. The mature inner bark extract contained sucrose, glucose, fructose and a trace of xylose. The outer bark extract contained glucose, fructose and sucrose, all in very small amounts. Trace amounts of xylose and arabinose were also present in this fraction.

Conclusions were drawn concerning the role of many of these substances in the biosynthesis of tannin, phlobaphene, flavonoids and bark lignin.

Microfilm $2.75; Xerox $4.20. 77 pages.

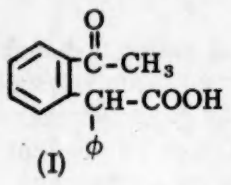
SYNTHETIC APPROACHES TO A SUBSTITUTED CYCLOBUTADIENE. PART I: THE STRUCTURE OF DISTYRINIC ACID. PART II: OTHER SYNTHETIC APPROACHES TO SUBSTITUTED CYCLOBUTADIENE.

(Order No. 61-3447)

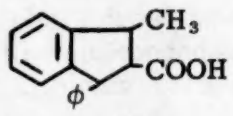
Doris Kivelevich, Ph.D.
Columbia University, 1961

Part I: The Structure of Distyrinic Acid.

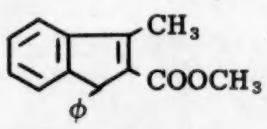
Treatment of cinnamic acid with 50% sulfuric acid yielded a monobasic acid, distyrinic acid. When the methyl ester was treated with an equimolar amount of N-bromosuccinimide, methyl dehydrodistyrinate was isolated. When the ester was treated with a threefold excess of N-bromosuccinimide, methyl dibromodehydrodistyrinate was isolated. Oxidation of either methyl distyrinate or methyl dehydrodistyrinate gave o-benzoylbenzoic acid. Ozonolysis of dehydrodistyrinic acid afforded o-acetyldiphenylacetic acid (I). Distyrinic acid was identified as structure (II), methyl dehydrodistyrinate as structure (III), and methyl dibromodehydrodistyrinate as structure (IV).



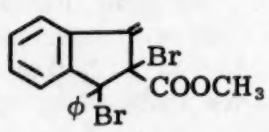
(I)



(II)



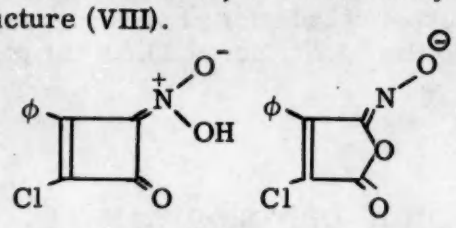
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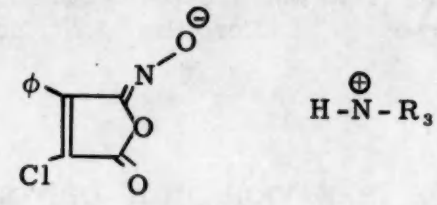
(IV)

Part II: Other Synthetic Approaches to Substituted Cyclobutadiene.

Reaction of 1,1-difluoro-2,2-dichloro-3-phenylcyclobutene (V) with sodium iodide yielded 1,1-difluoro-4-iodo-2-chloro-3-phenyl-2-cyclobutene. Reaction of (V) with sodium nitrite gave 1,1-difluoro-4-nitro-2-chloro-3-phenyl-2-cyclobutene (VI). When (VI) was added to diethylamine, 1-fluoro-1-diethylamino-2-chloro-3-phenyl-4-nitrobutadiene was isolated. When 2,2-dichloro-3-phenylcyclobutenone was treated with sodium nitrite, 4-aci-nitro-2-chloro-3-phenyl-2-cyclobutenone (VII) was isolated. When a dilute ethereal solution of triethylamine was added to (VII), a trialkylammonium salt was isolated. No structure could be assigned to the salt on the evidence available. However, it seems likely that the salt may be structure (VIII).



(VII)



(VIII)

Microfilm $2.75; Xerox $4.20. 76 pages.

THE PREPARATION OF 2,4,7-TRICHLOROIMIDAZO[4,5-d]PYRIDAZINE AND CERTAIN OF ITS DERIVATIVES.

(Order No. 61-3930)

Paul Herbert Laursen, Ph.D.
Oregon State University, 1961

Major Professor: Bert E. Christensen

The procedures employed for the synthesis of 2,4,7-(1H,3H,5H,6H)imidazo[4,5-d]pyridazine-trione, an isomer of uric acid, are described. This compound is prepared by treating esters of 2-imidazolone-4,5-dicarboxylic acid with hydrazine hydrate. In the preparation of these esters, it was established that diethyl Δ^3imidazolone-(2)-dicarboxylate(4,5) or Δ^4imidazolone-(2)-dicarboxylic(4,5) diethyl ester of Geisenheimer and Anschutz in 1899 is identical to the diethyl ester of glyoxalone-4,5-dicarboxylic acid of Fenton and Wilks prepared in 1912. Repetition of both processes yielded an identical product melting at the 200°C. reported by Geisenheimer and Anschutz. The process of Fenton and Wilks, while much faster and simpler, gave very poor and erratic results. Their method, which consisted of cyclizing dihydroxyfumaric acid with urea in ethyl alcohol in the presence of dry hydrogen chloride, gave much better results in other alcoholic media. Dibutyl 2-imidazolone-4,5-dicarboxylate proved to be the easiest to prepare and the most satisfactory to use for subsequent reactions.

The 2,4,7(1H,3H,5H,6H)imidazo[4,5-d]pyridazinetrione reacts smoothly with phosphorus oxychloride in the presence of diethylaniline to give 2,4,7-trichloroimidazo-[4,5-d]pyridazine, a key intermediate. Treatment of this compound with a variety of amines resulted in disubstitution products in all cases except when the amine was morpholine -- in which case 2,4,7-trimorpholinoimidazo-[4,5-d]pyridazine was formed. The position of substituents of the monochloro, dibenzylaminoimidazo[4,5-d]pyridazine was established by removing the chloro group with sodium in liquid ammonia and showing the resulting dibenzylaminoimidazo[4,5-d]pyridazine to be identical to the

4,7-dibenzylaminoimidazo[4,5-d]pyridazine previously prepared by Carbon. It was then assumed that the remainder of the diamino derivatives were also substituted 4 and 7. On this same premise, structures were assigned to the two new ring systems resulting from the treatment of 2-chloro-4,7-dihydrazinoimidazo[4,5-d]pyridazine with formic acid and with nitrous acid. A total of 14 new organic compounds were prepared, all of which may be physiologically active in one way or another. The 2,4,7-trichloroimidazo[4,5-d]pyridazine is a most important intermediate, from which a host of substituted products can be prepared. Microfilm $2.75; Xerox $3.60. 61 pages.

BEHAVIOR OF Δ^2-DIHYDROPYRAN OVER HOT ALUMINA

(Order No. 61-3387)

Triantaphyllos Philip Manolopoulos, Ph.D.
Boston University Graduate School, 1961

Major Professor: Walter J. Gensler

Earlier work has shown that alumina at 350° acts on tetrahydrofurfuryl alcohol labeled at its external methylene group with carbon-14, as well as on dihydropyran (Δ^2-dihydropyran) labeled at its 6 position with carbon-14 to produce an equimolecular mixture of dihydropyran-2-C^{14} and dihydropyran-6-C^{14}. The present work inquires into the possibility of oxygen and of hydrogen exchange in dihydropyran in contact with alumina under the same conditions.

Dihydropyran-O^{18} was synthesized for use in oxygen exchange experiments. Tetrahydrofurfuryl chloride, prepared from the corresponding alcohol with thionyl chloride and pyridine, was treated with sodium to give 4-penten-1-ol. This alcohol was converted to 1-bromo-4-pentene with phosphorus tribromide in pyridine. Reaction of the Grignard derivative of the bromo compound with formaldehyde-O^{18} gave 5-hexen-1-ol-O^{18}. The labeled formaldehyde was obtained by pyrolyzing labeled paraformaldehyde, which in turn was prepared from ordinary paraformaldehyde by depolymerization to formaldehyde, exchange of oxygen with water-O^{18}, and repolymerization. A mixture of 5-hexen-1-ol-O^{18} and 5-hexen-1-ol-1-C^{14} was ozonized and the product dehydrated to give dihydropyran labeled with oxygen-18 and (at position 6) with carbon-14.

Exposure of this dihydropyran to alumina at 350°, in confirmation of previous results, furnished dihydropyran with almost equal amounts of carbon-14 at positions 2 and 6. The same sample of treated dihydropyran contained only about half of the original oxygen-18. Accordingly, oxygen exchange does occur over alumina.

That hydrogen exchange also takes place was established by the fact that ordinary dihydropyran, after exposure to alumina that had been pretreated with tritiated water, contained tritium. Degradation showed that the tritium was located only at the dihydropyran 3 and 5 positions. Alumina is required for the tritium exchange, since no tritium was inserted on exposing dihydropyran plus tritiated water to glass wool at 350°.

The facts available are consistent with the simultaneous operation of two pathways, both leading to hydrogen exchange at positions 3 and 5 as well as to carbon exchange between positions 2 and 6 but only one leading to oxygen exchange. The mechanism with oxygen exchange calls for protonation at position 3 followed by ring opening and formation of a 5-hydroxypentanal-alumina complex similar to the one encountered in Meerwein-Pondorff-Verley processes. A shift of hydride from position 6 to position 2 is tantamount to an interchange of aldehyde and hydroxyl functions. Finally, reversal of the process by which the complex is formed regenerates dihydropyran, now with the double bond shifted to the other side of the ring.

This scheme predicts that the degree of oxygen exchange occurring under conditions that lead to complete carbon exchange at positions 2 and 6 should be considerably greater than 50%. Yet, it was found that only approximately half of the oxygen had exchanged in material in which the carbon process had reached completion.

Another concurrent process can account for the faster carbon exchange relative to oxygen exchange. Here, again protonation would occur at position 3. Rearrangement of the resulting carbonium ion by way of shift of hydride ion from position 6 to position 2, then regeneration of dihydropyran by loss of proton from the original position 5 would complete the process. This mechanism permits exchange of carbon without exchange of oxygen and provides an interpretation of the observed results.

From the tritium experiments, the appearance of tritium only at positions 3 and 5 eliminates the possibility of double bond migration around the carbon chain of the dihydropyran ring. This conclusion is in agreement with the earlier observation that Δ^3-dihydropyran, an intermediate in this kind of migration, fails to give Δ^2-dihydropyran over hot alumina.

Microfilm $3.45; Xerox $12.15. 268 pages.

REACTIONS OF TRIPHENYLPHOSPHINE WITH POLYHALOMETHANES: NEW FREE RADICAL PROCESSES AMONG TRIVALENT ORGANO-PHOSPHORUS COMPOUNDS.

(Order No. 61-3892)

Neil McKelvie, Ph.D.
Columbia University, 1961

The nucleophilic substitution at saturated carbon by which phosphonium salts are formed from triphenylphosphine and the monohalomethanes is greatly retarded or prevented when more than one halogen is present. This investigation has uncovered a new mechanism of reaction of the polyhalomethanes with tertiary phosphines: a free-radical chain process which involves phosphoranyl radicals, $R_3\dot{P}X$, with nine electrons in the phosphorus valence shell, as propagating species.

Thus, the reaction of triphenylphosphine with excess bromoform can be initiated photochemically and by peroxides, and even by oxygen and daylight, and is subject to inhibition by diphenylamine and other compounds. The chain-length in the benzoyl peroxide-catalysed reaction was estimated to be about 10,000. The product, dibromomethyltriphenylphosphonium bromide (I), was formed in high yields. With suitable precautions, it can be shown that the extent of reaction is

negligible at room temperature in the absence of light and radical initiators.

In contrast, the reaction between triphenylphosphine and excess methylene bromide had the characteristics of a slow nucleophilic displacement, and both bromomethyltriphenylphosphonium bromide (II) and methylene-bis-(triphenylphosphonium)dibromide (III), $\emptyset_3\overset{+}{P}\text{-}CH_2\text{-}\overset{+}{P}\emptyset_3\ (Br^-)_2$, were formed. Methylene iodide gave only iodomethyltriphenylphosphonium iodide (IV), but methylene bis (triphenylphosphonium diiodide (V) could be made from (III) and ammonium iodide in ethanol.

Excess iodoform in methylene chloride solution gave with triphenylphosphine a precipitate of diiodomethyltriphenylphosphonium iodide iodoform adduct (VI) $\emptyset_3\overset{+}{P}\text{-}CHI_2\ I^-(CHI_3)$. This salt is rather unstable: it is rapidly reduced to (IV) by triphenylphosphine in solution, by dimethylformamide and by refluxing ethanol. In ethanol solution, triphenylphosphine and iodoform gave a precipitate of iodomethylene-bis(triphenylphosphonium) diiodide iodoform adduct, (VII), $\emptyset_3\overset{+}{P}\text{-}CHI\text{-}P\emptyset_3\ (I^-,\ CHI_3)_2$, and also (IV) and triphenylphosphine hydriodide. Iodoform could be removed from (VII) by sublimation at about 140° and 0.1 mm. The product underwent an intramolecular oxidation-reduction when heated above its melting point, giving the remarkably stable bis(triphenylphosphonium)-methylide triiodide (VIII).

$$\emptyset_3\overset{+}{P}\text{-}CHI\text{-}\overset{+}{P}\emptyset_3\ (I^-)_2 \xrightarrow{180^\circ} \emptyset_3\overset{+}{P}\text{-}\overset{-}{C}H\text{-}\overset{+}{P}\emptyset_3\ I_3^- \text{ (VIII)}.$$

The iodide of this cation could be made from (V) on treatment with pyridine or other weak base, and other salts such as $\emptyset_3\overset{+}{P}\text{-}\overset{-}{C}I\text{-}\overset{+}{P}\emptyset_3\ I^-$ (IX) were made similarly.

The photochemical reaction of bromoform with excess triphenylphosphine did not give the expected bromomethylene bis(triphenylphosphonium) dibromide, (X), $\emptyset_3\overset{+}{P}\text{-}CHBr\text{-}\overset{+}{P}\emptyset_3\ (Br^-)_2$. Apparently this or its radical precursor oxidizes triphenylphosphine in solution, and the products are a "complex" of the formula

$$\left\{\begin{matrix}\emptyset_3\overset{+}{P}\text{-}CH_2\text{-}\overset{+}{P}\emptyset_3 \\ \emptyset_3\overset{+}{P}\text{-}\overset{-}{C}Br\text{-}\overset{+}{P}\emptyset_3\end{matrix}\right\}(Br^-)_3 \quad \text{(XI)},$$

along with triphenylphosphine dibromide. Addition of either HBr or base to (XI) gave 1:1 mixtures of the isomorphous bis-phosphonium salts or yields respectively, which could not be separated by fractional crystallization.

A number of other polyhalomethanes were briefly examined. Carbon tetrachloride (on U. V. irradiation) and carbon tetrabromide each gave the triphenylphosphine dihalides and unidentified other products. Neither chloroform nor methylene chloride reacted under the conditions used.

The following mechanism is suggested for the reaction with excess bromoform.

(1) $CHBr_3 \xrightarrow{U.V.} \cdot Br + \cdot CHBr_2$;

(2) $\emptyset_3P: + \cdot CHBr_2 \longrightarrow \emptyset_3\dot{P}\text{-}CHBr_2$;

(3) $\emptyset_3\dot{P}\text{-}CHBr_2 + CHBr_3 \longrightarrow [\emptyset_3\overset{+}{P}\text{-}CHBr_2\ \overset{-}{\dot{B}r}\text{-}CHBr_2] \longrightarrow \emptyset_3\overset{+}{P}\text{-}CHBr_2\ Br^-$ (I) $+ \cdot CHBr_2$

Microfilm $2.75; Xerox $6.20. 126 pages.

PART I: THE PREPARATION OF 3,4-DICHLORO-α-CUMYL ALCOHOL FROM A MIXTURE CONTAINING 3,4-DICHLOROCUMENE AND 2,3-DICHLOROCUMENE. PART II: ALUMINUM CATALYSTS FOR POLYMERIZATION OF ETHYLENE OXIDE.

(Order No. 61-3542)

Richard Allen Miller, Ph.D.
University of Pennsylvania, 1961

Supervisor: Charles C. Price

PART I

The objective of this investigation was to demonstrate a method for the preparation of 3,4-dichloro-α-cumyl alcohol (an important intermediate in the preparation of 3,4-dichloro-α-methylstyrene) from a mixture containing 85% 3,4-dichlorocumene and 15% 2,3-dichlorocumene.

The oxidation with molecular oxygen at 130° in the presence of strong base of a mixture containing 85% 3,4-dichlorocumene and 15% 2,3-dichlorocumene produced 3,4-dichloro-α-cumyl alcohol (20 to 30%), 3,4-dichlorobenzoic acid (1 to 5%), and 3,4-dichloroacetophenone (<1%). The 2,3-dichlorocumene did not oxidize and was recovered unchanged.

The resistance to oxidation of 2,3-dichlorocumene was attributed to a lack of resonance stabilization in a sterically hindered 2,3-dichloro-α-cumyl radical. Non coplanarity (steric hindrance) in the 2,3-dichloro-α-cumyl radical was demonstrated by comparing the infrared and ultraviolet spectra of 2,3-dichloro-α-methylstyrene and 3,4-dichloro-α-methylstyrene (same spatial arrangements as in the α-cumyl radicals. The 2,3-dichloro-α-methylstyrene absorbed at 6.10μ in the infrared and was transparent to ultraviolet radiation between 2200 Å and 2900 Å. The 3,4-dichloro-α-methylstyrene absorbed at 6.15μ in the infrared and had a moderately strong absorption (log E_{max} 4.11) at 2509 Å in the ultraviolet.

The shift to lower wavelengths in the infrared spectrum of the exo double bond absorption in 2,3-dichloro-α-methylstyrene and a transparency to ultraviolet radiation confirmed the existence of steric hindrance.

The rate of oxidation of 3,4-dichlorocumene was shown to be slower than the rate of oxidation of cumene. The difference in the rate was ascribed to the inhibiting effect of electron-withdrawing chlorine atoms on the formation and reactivity of α-cumyl radicals

PART II

The objective of this investigation was to demonstrate with ethylene oxide the utility of aluminum catalysts found effective in polymerizing propylene oxide.

Ethylene oxide polymerized after four to six days at 25° in the presence of an aluminum isopropoxide/zinc chloride catalyst to a high molecular weight ([η] 2) wax-like solid. The polymer exhibited a sharp transition at 64.8 to 65°, (demonstrated by dilatometry) and showed approximately one unsaturated end group per chain (determined by bromine addition in acetic acid). No hydroxyl end groups were detected by attempted reaction of the polymer with phthalic anhydride in pyridine or by an increase in viscosity with 2,4-tolylene diisocyanate.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

The absence of hydroxyl groups in polyethylene oxide prepared as described previously supports the "conjugate propagation" process for polymerization proposed earlier by Price and Osgan (Initiation occurred by addition of an alkoxy group from aluminum).

Polymerization of ethylene oxide at 80° with aluminum triisobutyl catalyst (no appreciable polymerization occurred at 25°) gave a polymer with properties similar to polymer from aluminum isopropoxide/zinc chloride catalysts ([η] 2) but in lower yield (22% vs. 95% for aluminum isopropoxide/zinc chloride).

Microfilm $2.75; Xerox $3.00. 50 pages.

SYNTHESES OF SOME 1:8-NAPHTHYRIDINES.

(Order No. 61-3934)

Ovart Nitidandhaprabhas, Ph.D.
Oregon State University, 1961

Major Professor: A. V. Logan

The Doebner synthesis on 6-methyl-2-amino pyridine, 2,6-diaminopyridine, and the modified Knorr's synthesis between 6-methyl-2-amino pyridine and acetyl acetone were investigated as possible methods of synthesizing 1:8-naphthyridines. Previously, two solid products, yellow and white, were isolated by Lewis from the reacting mixture of the Doebner reaction between 6-methyl-2-amino pyridine, benzaldehyde and pyruvic acid. He assigned the structure of the yellow compound to be γ-phenyl-γ-(6-methyl-2-pyridyl amino) α-oxobutyric acid, but did not establish the structure of the white product. To identify this white compound, two similar reactions on 6-methyl-2-amino pyridine were studied, using anisaldehyde and o-methoxy benzaldehyde in place of benzaldehyde. Similar yellow and white products were isolated and were found to exist in equilibrium. Boiling 95% alcohol will convert most of the yellow compound to the white one, whereas boiling 50% aqueous alcohol will cause the opposite conversion. The yellow compound from the Doebner condensation between 6-methyl-2-amino pyridine, anisaldehyde and pyruvic acid was assigned the structure of γ-(4-methoxy phenyl)-γ-(6-methyl-2-pyridylamino)-α-oxobutyric acid. The yellow compound from the Doebner reaction between 6-methyl-2-amino pyridine, o-methoxy benzaldehyde, and pyruvic acid has been assigned the structure of γ-(2-methoxy phenyl)-γ-(6-methyl-2-pyridyl amino)-α-oxobutyric acid.

The identification of the white compounds as derivatives of 2,3-pyrrolidine-diones has been done by a synthesis to eliminate the possibility of cyclization of the yellow compounds at the benzene ring as is shown to be favorable by the model, and also by the use of ultraviolet and infrared spectra. The proposed structure was supported by the ultraviolet spectrum of the white product from the reaction between 6-methyl-2-amino pyridine, anisaldehyde and pyruvic acid which shows three maximum absorptions at 300 mμ ($E = 1.40 \times 10^4$), 282 mμ ($E = 1.61 \times 10^4$) and 228 mμ ($E = 1.90 \times 10^4$). The absorption at 282 mμ has been assigned to the five-membered ring of 2,3-pyrrolidine-diones. The presence of the enolic group in the same compound was also confirmed by its infrared spectrum. Therefore, the above white compound was assigned the structure of 1(6-methyl-2-pyridyl) 5(4-methoxy phenyl)-2,3-pyrrolidine-diones. Likewise, the white product from the reaction between 6-methyl-2-amino pyridine, o-methoxy benzaldehyde and pyruvic acid and Lewis' white compound have been assigned the structure of 1(6-methyl-2-pyridyl) 5(2-methoxy phenyl)2,3-pyrrolidine-diones and 1(6-methyl-2-pyridyl)5-phenyl-2,3-pyrrolidine-diones, respectively.

The reaction of 2,6-diamino pyridine in the Doebner synthesis did produce 1:8-naphthyridines. The product from the reaction between 2,6-diamino pyridine, formaldehyde and pyruvic acid was isolated as a monohydrochloride and has been assigned the structure of 7-amino-1,2,3,4-tetrahydro-1:8-naphthyridine-4-carboxylic acid monohydrochloride. The reaction product between 2,6-diamino pyridine, benzaldehyde and ethyl pyruvate was isolated as a free base and has been assigned the structure of 2-phenyl-4-carbethoxy-7-pyruvylamino-1,2-dihydro-1:8-naphthyridine. The proposed structures are supported by the ultraviolet spectra of the compounds which show two well-defined maxima around 240 mμ and 340 mμ.

Microfilm $2.75; Xerox $4.20. 77 pages.

THE SYNTHESIS OF A SERIES OF 3-HALO-4-DIALKYLAMINOALKOXY-5-ALKOXYANILINES

(Order No. 61-3950)

Donald Frederick Page, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisors: Dr. R. O. Clinton and Dr. John B. Cloke

A series of 4-dialkylaminoalkoxy-3-alkoxyanilines was desired for testing as intradermal local anesthetics. A review of basic esters, amides and ethers exhibiting useful local anesthetic activity is presented, as is a more detailed review of the dialkylaminoalkoxyanilines in the literature.

The 4-dialkylaminoalkoxy-3-alkoxyaniline hydrochlorides prepared proved to be too susceptible toward air oxidation to be useful, as did the isomeric 3-dialkylaminoalkoxy-4-alkoxy- and 2-dialkylaminoalkoxy-5-alkoxyaniline hydrochlorides. Stabilization was finally effected by halogenation leading to a series of 3-bromo- and 3-chloro-4-dialkylaminoalkoxy-5-alkoxyaniline hydrochlorides (alkoxy = methoxy to hexoxy). The lower members of the series are especially potent, quick-acting local anesthetics.

Pyrocatechol was alkylated with an alkyl benzenesulfonate to give a 1,2-dialkoxybenzene which in turn was nitrated to yield a 1,2-dialkoxy-4-nitrobenzene. The displacement of the 1-alkoxy group in aqueous potassium hydroxide gave the corresponding 2-alkoxy-4-nitrophenols, which is an extension of this type of displacement as described by Pollecoff and Robinson (1918) and Oliverio (1943). This displacement applied to the corresponding lower 1,4-dialkoxy-2-nitrobenzenes gave lower yields of 4-alkoxy-2-nitrophenols. Both displacements are described and discussed in some detail. Bromination of the 2-alkoxy-4-nitrophenols with bromine or pyridinium

bromide perbromide, or chlorination with gaseous chlorine, produced the 2-halo-6-alkoxy-4-nitrophenols. A Williamson ether synthesis between the latter and a dialkylaminoalkyl chloride yielded the 1-halo-2-dialkylaminoalkoxy-3-alkoxy-5-nitrobenzenes, which were then reduced by means of a Béchamp reduction to the desired 3-halo-4-dialkylaminoalkoxy-5-alkoxyanilines. Hydrogenation of the intermediate brominated nitro ethers over palladium resulted in the partial hydrogenolysis of the bromine.

The unstable 4-dialkylaminoalkoxy-3-alkoxyanilines were prepared from the pyrocatechol ethers as above, but without halogenation. Intermediates for the 3-dialkylaminoalkoxy-4-alkoxyanilines were prepared from the parent 2-alkoxyphenyl acetates. Nitration, saponification and a Williamson ether synthesis with a dialkylaminoaklyl chloride gave the 1-dialkylaminoalkoxy-2-alkoxy-5-nitrobenzenes, which were then reduced as above. The 2-dialkylaminoalkoxy-5-alkoxyanilines were derived from the corresponding ethers of hydroquinone in a manner which paralleled the preparation of 3-halo-4-dialkylaminoalkoxy-5-alkoxyanilines, but without halogenation. The intermediate 4-alkoxy-2-nitrophenols did not readily give monobromo or monochloro derivatives.

Microfilm $2.75; Xerox $4.20. 76 pages.

SYNTHETIC APPROACHES TO THE YOHIMBINE ALKALOIDS VIA THE DIELS-ALDER REACTION

(Order No. 61-3467)

Joseph Rubinfeld, Ph.D.
Columbia University, 1961

The possibility of synthesizing members of the Yohimbine alkaloid series by suitable Diels-Alder reactions followed by further synthetic operations was examined. The main objective was to use the stereospecific selectivity of the Diels-Alder reaction as a tool in building a cyclohexane ring system with the proper stereochemical relationships and the necessary functional groups needed to form the D and E rings of the Yohimbine alkaloid series. A secondary objective was to study a number of Diels-Alder reactions involving unsymmetrical poly-functional dienes and dienophiles in order to determine the structural specificity of these reactions.

An intermediate for Yohimbane (I) could be derived from the Diels-Alder condensation of butadiene (II) and glutaconic ester (III). Similarly, an intermediate for Yohimbine (IV) could be derived from the condensation of 1,5 diacetoxy 1,3 pentadiene (V) and glutaconic ester.

The condensation of glutaconic ester and butadiene gave trans-1,2,3,4-tetrahydro-methyl homophthalate (VI) in 75% yield. Reduction with PtO_2/H_2 gave trans-hexahydro-methyl homophthalate (VII) in 90% yield. Hydrolysis of the diester gave trans-hexahydro-homophthalic acid (VIII) in 90% yield. The di-acid was converted by acetic anhydride in 92% yield to the trans anhydride (IX) which was then treated with 1 mol of sodium methoxide to give in 89% yield the trans primary half-ester of hexahydrohomophthalic acid (X). Treatment with a slight excess of oxalyl chloride in benzene gave the crude half acid chloride-half ester (XI) which was then reduced with $NaBH_4$ in dioxane to the lactone of trans-2-(hydroxymethyl)-cyclohexane-acetic acid (XII). The over-all two-step yield of acid chloride formation and reduction was 66%. The trans lactone was identical with an authentic sample prepared from trans beta-decalol and was converted to the corresponding bromo-ester (XIII) by ethanolic HBr. The bromo ester was condensed with tryptamine (XIV) to give the cyclic lactam (XV). This lactam was identical to that previously prepared by Van Tamelen who carried the sequence to its successful conclusion via ring closure and reduction to Yohimbane.

Thus the preparation of an intermediate capable of producing yohimbane has been achieved by a sequence employing the stereospecificity of the Diels-Alder reaction.

This synthesis of the Yohimbane skeleton involved a Diels-Alder reaction in which the diene was symmetrical and therefore presented no problem as to structural specificity. The intermediate necessary for Yohimbane would however involve the further question of structural specificity. The course of the Diels-Alder reaction with model compounds was investigated prior to pursuing the condensation of 1,5 diacetoxy 1,3 pentadiene with glutaconic ester.

It was shown by a series of synthetic conversions that the condensation of 1,5 diacetoxy 1,3 pentadiene (V) and methyl acrylate (XVI) gave a mixture of isomers in which the isomer with the acetoxy and carbomethoxy groups ortho to one another was favored by 4:1.

The direction of addition was thus established as the one desired for the Yohimbine synthesis. The condensation of (V) and glutaconic ester gave an adduct mixture which was shown by various synthetic conversions to consist mainly of the desired ortho adduct (XVII) with some meta adduct (XVIII).

Attempted reduction of the double bond led to partial hydrogenolysis of the allylic acetate as shown by C & H analysis, acetyl determination and a greater than theoretical hydrogen uptake. Among the catalysts employed were PtO_2, Pd/C, RuO_2, $Pd/BaSO_4$ and $Pd/SrCO_3$. In all cases partial hydrogenolysis took place. The successful culmination of this synthetic approach must await the discovery of a catalyst which will not remove the acetate function. Attempts to separate the mixture of hexahydro-homophthalates resulting from the reduction or to use the mixture in further synthetic work were unsuccessful. These included total, partial or selective hydrolyses and treatment with HBr-ethanol. Treatment with sodium in methanol effected ester exchange and simultaneous lactonization. A mixture of 5 and 6 membered lactones was isolated. The lactone mixture could not be separated by chemical or mechanical means. A method must be found to either selectively hydrolyze the lactone function in the presence of acetate and ester functions or to convert the lactone to the bromo or tosyl ester before the synthesis can be successfully completed.

Among the new dienes synthesized in the course of the Diels-Alder investigations were:

1,5 diacetoxy 1,3 pentadiene	(V)
1 hydroxy 5 acetoxy 1,3 pentadiene	(XIX)
1 acetoxy 1,3 pentadiene	(XX)
1 methoxy 5 hydroxy pentadiene	(XXI)
1 methoxy 5 acetoxy pentadiene	(XXII)

Microfilm $2.75; Xerox $5.40. 107 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

A STUDY ON THE MECHANISM OF THE BASE-INITIATED POLYMERIZATION OF PROPYLENE OXIDE AND THE BASE-CATALYSED REARRANGEMENT OF ALLYL TO PROPENYL ETHERS

(Order No. 61-3559)

William Henry Snyder II, Ph.D.
University of Pennsylvania, 1961

Supervisor: Charles C. Price

Part I.

The polymerization of propylene oxide has been examined using solid metal hydroxide and alkoxide initiators. Evidence is presented for the occurrence of a chain-transfer reaction with monomer involving proton abstraction from the methyl group on propylene oxide to produce allyloxide ion. The amount of chain-transfer produced (relative to chain propagation) is the same for several hydroxides and alkoxides and appears to be independent of cation. The polymerization of propylene oxide-3,3,3-d_3 with potassium hydroxide shows no primary isotope effect on the chain-transfer reaction. The potassium hydroxide initiated polymerization was found to stop prematurely at high monomer to catalyst ratios. Evidence based on high initiator consumption suggests that this polymerization is apparently not a specific surface-catalysed reaction. The results with the hydroxide-initiated polymerizations indicate that proton exchange with initiator probably occurs both in the initiation step and the chain-transfer step. A large effect of size of cation on the rate of polymerization has been shown in both the hydroxide and alkoxide-initiated polymerizations. The rate increases as size of cation increases.

Part II.

The base-catalysed rearrangement of several allyl ethers has been shown to proceed in high yield to the respective propenyl derivatives under relatively mild conditions (room temperature to 80°). Alcohol-free potassium t-butoxide was found to be a particularly effective homogeneous catalyst. Large increases in rate are observed for the potassium t-butoxide catalysed rearrangement of allyl phenyl ether in going from dimethoxyethane to dimethyl sulfoxide solvent. Solid alkali metal hydroxides are effective catalysts at higher temperature (150°), but their effectiveness is largely dependent on size of cation (the rate increases with increasing size of cation). The rearrangement proceeds to give almost exclusively the cis-propenyl isomers, but small detectable amounts of the trans-isomer are always formed. Kinetic studies established some pseudo-first-order half times for the rearrangement of several allyl ethers. A mechanism for the isomerization reaction is proposed. Mercuric acetate was found to be an effective catalyst for cis-trans interconversion of propenyl ethers. This catalyst cyclized β-propenoxypropanols to the substituted 1,3-dioxolane. Infrared molar extinction coefficients for double bond absorption are reported along with ultra-violet absorption data.

Microfilm $4.35; Xerox $15.30. 338 pages.

THE t-BUTYL HYPOCHLORITE CHLORINATION OF OLEFINS

(Order No. 61-3473)

Warren Alan Thaler, Ph.D.
Columbia University, 1961

The reaction between t-butyl hypochlorite and olefins in non polar media has been investigated. The photochemically induced reaction proceeds by a radical mechanism which involves the t-butoxy radical as a chain carrier, and is free from competing polar reaction. Allylic chlorides and t-butyl alcohol are the principle products of this reaction, together with small amounts of β-chloroalkyl t-butyl ether which is produced from the addition of t-butoxy radical to the double bond.

The abstraction of primary allylic hydrogens from cis and trans-2-olefins by t-butoxy radical under the proper conditions gives rise to allyl chlorides (1-chloro-2-olefins) that have the same geometry as the parent hydrocarbon. Thus trans-2-butene yields trans-1-chloro-2-butene and 3-chloro-1-butene while cis-2-butene gives cis-1-chloro-2-butene as well as 3-chloro-1-butene. 1-Olefins, on the other hand, give a mixture of cis and trans-1-chloro-2-olefin (as well as 3-chloro-1-olefin), the ratio of the two being dependent on the size of the alkyl group. For example the distribution between trans and cis-1-chloro-2-olefins is as follows: 1-butene-65% trans, 1-pentene-74% trans, 4,4-dimethyl-1-pentene-100% trans.

The results obtained from the chlorination of a number of olefins are discussed in detail and an intermediate allylic radical which maintains its stereochemical integrity is postulated to explain these results.

The reactivities of different allylic hydrogens, as well as other commonly encountered alkyl and benzyl hydrogens, toward t-butoxy radical has been studied in order to determine the selectivity of t-butoxy radical, and gain an insight into the usefulness of t-butyl hypochlorite as a tool for affecting the selective synthesis of allylic chlorides.

The factors influencing the distribution between 1-chloro-2-olefin and 3-chloro-1-olefin are discussed in detail. Microfilm $2.75; Xerox $5.20. 102 pages.

SUBSTITUTED s-TRITHIANES

(Order No. 61-3570)

Jacqueline Someroski, Vittimberga, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Charles C. Price

In connection with a program to investigate new compounds which might possess carcinostatic properties, it became of interest to prepare certain substituted s-trithianes.

2,4,6-Tris (chloromethyl)-s-trithiane was synthesized in 13.9% yield from chloroacetaldehyde and hydrogen sulfide at -10° in glacial acetic acid saturated with hydrogen chloride. Under these conditions two isomers were obtained. The major product was the β-isomer melting at

164 - 166°. A small quantity of the α-isomer which melted at 98.5 - 99.5° was also isolated. Variation of solvent and temperature did not improve the method of preparation.

When β-2,4,6-tris (chloromethyl)-s-trithiane was subjected to oxidation with ozone in chloroform solution only a monosulfoxide could be isolated. No sulfone formation was observed in this reaction or in other reactions in which a variety of oxidizing agents were used.

Upon treating 2,4,6-tris (chloromethyl)-s-trithiane with methanolic potassium hydroxide dehydrohalogenation proceeded smoothly with the formation of 2,4,6-tris (methylene)-s-trithiane. This olefin is an unstable, colorless liquid with a melting point of -19° to -21° and a refractive index of n_D^{23} 1.6753. The ultraviolet spectrum showed $\lambda_{max.}$ 245 mμ(logϵ = 4.20) and a shoulder at 265 mμ. The olefin added three molecules of diazomethane to form a tripyrazoline which underwent thermal decomposition with the elimination of one molecule of nitrogen. From the infrared spectrum and nitrogen analysis of the product it was concluded that the tripyrazoline had partially decomposed to the monocyclopropyl derivative.

2,4,6-Tris (2-chloroethyl)-s-trithiane was also prepared by the reaction of β-chloropropionaldehyde with hydrogen sulfide under the same conditions as described for 2,4,6-tris (chloromethyl)-s-trithiane. A high melting isomer was obtained which melted at 129.5 - 131.5°. A second material was obtained which melted at 54.5 - 58° and had a similar infrared spectrum to that of the higher melting compound. However, an elemental analysis was not obtained which was within experimental error. Oxidation of the high melting isomer with 30% hydrogen peroxide in acetic acid followed by treatment with potassium permanganate resulted in the formation of the corresponding disulfone.

Attempts to dehydrohalogenate 2,4,6-tris (2-chloroethyl)-s-trithiane with methanolic potassium hydroxide resulted mainly in the displacement of the chlorine atoms by methoxyl groups. When an attempt was made to dehydrohalogenate the disulfone of this compound with potassium hydroxide in methanol at room temperature, decomposition to a carbonyl containing compound resulted.

Trithiocyclopropanone which could not be prepared from the diazomethane adduct of 2,4,6-tris (methylene)-s-trithiane, was finally synthesized by treating 2,4,6-tris (2-chloroethyl)-s-trithiane with potassium amide in liquid ammonia. The structure of the product was determined by elemental analysis and from its infrared, ultraviolet and nuclear magnetic resonance spectra.

Microfilm $2.75; Xerox $4.80. 92 pages.

CHEMISTRY, PHARMACEUTICAL

DERIVATIVES OF AZABICYCLOÕCTANES AND AZABICYCLODECANE PREPARED FROM MANNICH BASES

(Order No. Mic 61-1788)

Eugene Norman Skiest, Ph.D.
University of Michigan, 1961

Derivatives of three parent azabicyclic compounds were prepared by the use of Mannich bases: 2-azabicyclo-[2.2.2]octane, 6-azabicyclo[3.2.1]octane and 8-azabicyclo-[5.2.1]decane.

A number of salts of Mannich bases, in addition to those used for the preparation of azabicyclic compounds, were synthesized. These salts were prepared from a ketone or an aldehyde, the salt of a primary or secondary amine and paraformaldehyde. The ketones and aldehydes employed were cyclopentanone, cyclopentenone, cyclohexanone, cyclohexenone, 3,3,5-trimethylcyclohexanone, 3,3,5-trimethyl-5-cyclohexenone (isophorone), cycloheptenone, cycloõctanone, 3-cyclohexene-1-carboxaldehyde and 6-methyl-3-cyclohexene-1-carboxaldehyde. The amine salts used were dimethylamine, benzylamine and N-methylbenzylamine.

In one sequence of reactions which led to an azabicyclic product, 1-(dimethylaminomethyl)-3-cyclohexene-1-carboxaldehyde hydrochloride (I) was reduced to 1-(dimethylaminomethyl)-1-hydroxymethyl-3-cyclohexene hydrochloride (II). Compound II was heated with hydrobromic acid. After the crude material had been treated with alkali and extracted with ether, 2-methyl-4-bromomethyl-2-azabicyclo[2.2.2]octane methobromide (III) or 1-bromomethyl-6-methyl-6-azabicyclo[3.2.1]octane methobromide (IV) gradually precipitated from the extract. After filtration of this product (III or IV), the ether was removed from the extract and the residue was heated in isopropyl alcohol whereby 2-methyl-4-hydroxymethyl-2-azabicyclo-[2.2.2]octane methobromide (V) was obtained.

Attempts to convert V into III, and III (or IV) into V (or 1-hydroxymethyl-6-methyl-6-azabicyclo[3.2.1]octane methobromide (VI)), were unsuccessful.

The synthesis of compound VI was attempted in the following manner. 1-(Dimethylaminomethyl)-3-cyclohexene-1-carboxaldehyde ethylene acetal acid oxalate, prepared from I, was treated with N-bromosuccinimide. The reaction mixture was made basic and the organic base was cyclized, by heating it in isopropyl alcohol, to 2-bromo-6-methyl-6-azabicyclo[3.2.1]-3-octene-1-carboxaldehyde ethylene acetal methobromide (VII). It was hoped that VI could be obtained by hydrolysis of VII and subsequent hydrogenation; however, it was not found possible to effect the hydrolysis.

It was found possible to obtain VI by the following sequence of processes. The acid oxalate of II was treated with N-bromosuccinimide, the mixture was made basic and extracted with ether. The base, isolated from the extract, was heated in isopropyl alcohol whereupon it cyclized to 1-hydroxymethyl-2-bromo-6-methyl-6-azabicyclo[3.2.1]-3-octene methobromide (VIII). Compound VIII was converted into VI by hydrogenation.

In order to obtain 2-benzyl-4-hydroxymethyl-2-azabicyclo[2.2.2]octane methobromide (X), 1-(N-methylbenzylaminomethyl)-3-cyclohexene-1-carboxaldehyde

hydrochloride (IX) was reduced to 1-(N-methylbenzylaminomethyl)-1-hydroxymethyl-3-cyclohexene hydrochloride. This salt was converted into the acid oxalate which was treated with hydrobromic acid. The base of the bromo derivative was heated in isopropyl alcohol whereby X was formed. Compound X was debenzylated to yield 2-methyl-4-hydroxymethyl-2-azabicyclo[2.2.2]octane hydrobromide.

Upon hydrogenation, IX was converted into 1-(methylaminomethyl)-1-hydroxymethylcyclohexane, which was isolated as the picrate.

2,5-Dimethyl-4-hydroxymethyl-2-azabicyclo[2.2.2]-octane methobromide was prepared by reduction of 1-(dimethylaminomethyl)-6-methyl-3-cyclohexene hydrochloride to 1-(dimethylaminomethyl)-1-hydroxymethyl-6-methyl-3-cyclohexene hydrochloride (XI), treatment of XI with hydrobromic acid, conversion of the product into the base and heating the base in isopropyl alcohol.

8-Methyl-10-keto-8-azabicyclo[5.2.1]decane methopicrate was obtained by a series of reactions in which 2-(dimethylaminomethyl)cyclooctanone hydrobromide was brominated to yield 2-(dimethylaminomethyl)-8-bromocyclooctanone hydrobromide (XII). In order to prevent side reactions, XII was treated with ethylene glycol, in the presence of p-toluenesulfonic acid, the reaction mixture was made basic and the crude organic base was heated in isopropyl alcohol to effect cyclization. The methobromide obtained was converted into the methopicrate.

Microfilm $2.75; Xerox $4.80. 93 pages.

CHEMISTRY, PHYSICAL

A KINETIC STUDY OF PIG LIVER ESTERASE

(Order No. Mic 61-2675)

Alice Joan Adler, Ph.D.
Harvard University (Radcliffe College), 1961

Research Director: Professor G. B. Kistiakowsky

A study was made of the kinetics of ester hydrolysis catalyzed by the enzyme pig liver esterase. The reaction rates were measured with a pH-stat which employed a glass electrode. The reaction mixtures were unbuffered, thus eliminating any inhibitory effects of extraneous chemical species upon the enzyme.

The enzyme preparation was highly purified and was shown to contain only one esterase. Several physical and chemical properties of pig liver esterase were characterized.

The rates of enzymatic hydrolysis of simple aliphatic esters were found not to obey the conventional Michaelis-Menten equation. The observed kinetics could be explained by either of two mechanisms: (i) substrate activation or (ii) the existence of two identical interacting active sites on the enzyme molecule. The kinetic parameters were altered by partial heat denaturation of the esterase.

The rates were measured over a wide range of pH. The pH dependence was in accord with the involvement in the catalysis of both a histidine residue and a dicarboxylic amino acid residue.

Studies of the effects of added electrolytes failed to reveal any electrostatic interaction between enzyme and substrate.

Data obtained from systematic addition of the reaction products (alcohol and acid) showed that (i) the alcohol is released before the acid during the course of the hydrolysis, and (ii) the undissociated acid is the substrate for the reverse (synthesis) reaction.

Several ester substrates of pig liver esterase were compared. Differences were found between the kinetic behavior of pig liver esterase and horse liver esterase.

Microfilm $2.75; Xerox $9.45. 206 pages.

STUDIES IN THE STATISTICAL MECHANICS OF IRREVERSIBLE PROCESSES

(Order No. Mic 60-6777)

Frank Clinton Andrews, Ph.D.
Harvard University, 1961

Research Director: Professor I. Prigogine

A method of treating the Liouville equation, representing the classical motion of an ensemble, developed by Prigogine and co-workers is presented concisely in a resolvant operator formalism. The method may be considered a time dependent perturbation approach carried formally to all orders in strength of interaction. Analysis shows that after time of order of a molecular relaxation time simple scattering processes drive the velocity part of the distribution function to a function of the unperturbed Hamiltonian. The correlations which arise at equilibrium are precisely those of classical equilibrium statistical mechanics, their derivation being quite straightforward. Inhomogeneous systems are studied and similar time behavior is found, the problem separating into study of a closed equation for the singlet distribution function and a functional equation for distribution functions representing correlations.

Green's functions of various forms of the Liouville equation are formulated by an inverse operator technique in Fourier space. The same method is used to study the Liouville equation itself, and the results shed light on the meaning of functionals which arose earlier. The outline of a rigorous theory of transport processes in dense gases is given. Microfilm $2.75; Xerox $7.00. 148 pages.

POLAROGRAPHIC EVIDENCE ON THE RESONANCE STABILIZATION OF SOME SUBSTITUTED CYCLOPROPENYL CATIONS

(Order No. 61-3415)

William Shaul Bahary, Ph.D.
Columbia University, 1961

The difference in resonance stabilization between the 2 and 3 π-electron systems is determined. The reversible

reduction potentials of triphenylmethyl cation (TMC), diphenylcyclopropenyl cation, triphenylcyclopropenyl cation (TCC), mono-p-anisyldiphenylcyclopropenyl cation, di-p-anisylphenylcyclopropenyl and tri-p-anisylcyclopropenyl cations are determined in anhydrous acetonitrile by means of oscillopolarography. These are -.09, -1.02, -1.13, -1.24, -1.37, and -1.49 v. versus Ag/.1M $AgClO_4$ in acetonitrile reference electrode. Since TMC and TCC are so similar in structure, the difference in reduction potential is attributed to resonance stabilization. It is argued and suggested by evidence that the differences in solvation energies and coulombic attraction for an electron are small and furthermore tend to cancel each other. The experimental evidence suggests that, using TMC as a standard, the difference in resonance stabilization between TCC and its radical is 1.04 e.v. over and above that between TMC and its radical.

The difference in delocalization energy, Δ D.E., between TMC and its radical, as calculated by R. Breslow and H. Chang using the zero order molecular orbital approximation, is equal to zero, that between TCC and its radical is .504 β where β is the resonance parameter. By deducing the value of β from Hoijtink's experiments (β~ -2.25 e.v.) or from Streitwieser's results, (β~-2.11 e.v.), both theory and experiment indicate that the difference in Δ D.E. between TMC and TCC reductions is of the order of 1 e.v. Microfilm $2.75; Xerox $3.00. 58 pages.

YIELD STRESSES AND FLOW PROPERTIES OF CARBOXYPOLYMETHYLENE-WATER SYSTEMS

(Order No. 61-3944)

William Henry Fischer, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Dr. W. H. Bauer

Carbopol-water dispensions containing 0.5, 1, 3 and 5.5% polymer were prepared. Ammonium hydroxide was added to samples of each concentration to give test samples of various pH for investigation at 15, 25 and 35° C.

Flow data were obtained with a cone and plate viscometer equipped with automatic programming and automatic recording of shear stress vs. shear rate, and by point plotting under equilibrium flow conditions. Flow curves, shear stress vs. shear rate, were obtained for an 800 second shear cycle with maxima of 1136 and 11,292 $sec.^{-1}$. Equilibrium curves were obtained up to the same maxima.

Yield stresses were determined from either quiescent or flow conditions, but most often from flow conditions, with equilibrium being considered established when no change occurred in 600 seconds. The yield stress was rapidly and reversibly established after shear in flow.

The equation of Herschel and Bulkley, $\tau - \tau_y = A D^N$, was found to give a good fit to the experimental flow curves under all conditions studied.

The unusual flow properties exhibited were related to the branched chain character of the carboxypolymethylene molecule.

The experimental data were compared with Bueche's and Goodeve's flow theories. Agreement with Bueche's theory was very good, and molecular weights calculated therefrom lie in a reasonable range.

Microfilm $2.75; Xerox $4.80. 92 pages.

THE STATISTICAL THERMODYNAMICS OF POLYMER ADSORPTION

(Order No. 61-3510)

William Comstock Forsman, Ph.D.
University of Pennsylvania, 1961

Supervisor: Robert E. Hughes

A statistical model for flexible linear polymer molecules was developed in an appropriate form for the inclusion of the effect of anisotropic interactions. Each polymer molecule of an assembly was assumed to be partially characterized by specifying its three radii of gyration, S_x, S_y, and S_z, relative to the three arbitrary orthogonal axed, x, y, and z. The distribution functions associated with S_i, $w(S_i)$, were then derived for unperturbed conditions (at the Flory θ temperature) and expressed as a multiple integral. Approximations to $w(S_i)$ were given as well as the assymtotic form which applies for large S_i.

The polymer molecules were then assumed to be completely characterized by assuming that the distribution of segments about the center of each member of the assembly could be approximated by a product of Gaussian functions in each of the variables. The free energy of mixing, $\Delta F^*(S_x,S_y,S_z)$, of any given polymer molecule was calculated by the Flory-Huggins method and expressed as a function of S_x,S_y, and S_z. The distribution functions associated with S_i under more generalized conditions, $W(S_i)$, were given by

$$W(S_i) = w(S_i)\exp -\Delta F^*(S_x,S_y,S_z)/kT$$

The theory was applied to the dilute solution properties of polymers and was found to be in good agreement with existing theories. In addition, the asymtotic form of $w(S_i)$ was used to predict the behavior of polymers in very good solvents. It was found that it was in better agreement with the literature, in the one case examined, than other theories currently in use.

The above technique was then extended to include the effect of polymer-surface interactions, and the essential configurational features were calculated for polymer molecules near an interface. Adsorption isotherms were derived in the regions of slight surface coverage and of nearly complete surface coverage. It was found that at slight coverage the isotherms should be of the Langmuir type with adsorption increasing with increasing molecular weight and decreasing with increasing temperature. At high surface coverage the theory predicts that adsorption will increase with increasing temperature. The effect of molecular weight was indeterminate, but was predicted to be small.

It was also found that when the polymer-surface interaction exceeds 2kT per polymer segment the polymer molecules may be partially collapsed onto the adsorbing surface. This was in complete agreement with other recent theoretical work. For small or negative polymer-surface interactions the theory predicts that one would observe negative adsorption.

Experiments were performed to test the adsorption theories. The poly-(methyl methacrylate) - toluene - silica and silicic acid systems were found to be examples of low surface coverage. Adsorption increased with molecular weight. The poly-(methyl methacrylate) - carbon tetrachloride - silicic acid system was found to be an example of high surface coverage, and adsorption decreased with molecular weight and increased with temperature.

The negative adsorption phenomenon predicted by theory was observed in the poly-(methyl methacrylate) - silicic acid - 2-butanone and 2-heptanone systems. In the former system the polymer concentration in the supernatant increased linearly with the ratio of adsorbent to solution.

Microfilm $2.75; Xerox $9.00. 198 pages.

POTENTIOMETRIC AND VISCOMETRIC TITRATIONS OF POLYACRYLIC AND POLYMETHACRYLIC ACIDS WITH ALKALI METAL AND QUATERNARY AMMONIUM BASES

(Order No. 61-3750)

Michael Frederick, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Harry P. Gregor

Lithium ions, and to a lesser extent, the sodium ions are bound by polyacrylic acid, as evidenced by pH titrations of polyacrylic acid in dilute (0.01 M) solutions of the alkali metal bases and solutions of their corresponding salts. The formation constant for the binding of lithium to polyacrylic acid was found to be 1.9.

When dilute solutions of polyacrylic and polymethacrylic acids were titrated with quaternary ammonium bases, the polyacids became progressively weaker with increasing size of the counter-ion. These phenomena suggest that the counter-ions are largely held in close proximity to the polyanion chain, with distances of approach comparable to the sum of the ionic radii. Titrations of these acids with a mixture of a large and small cation also served to point up the increased chain potential in the presence of large cations. All of these effects are absent with the analogous low molecular-weight acids.

The reduced specific viscosity of polymethacrylic acid increased with counter-ion size at the same degree of neutralization for the cations: sodium < tetramethylammonium < tetraethylammonium < tetrapropylammonium < tetrabutylammonium. The increase on going from sodium to tetrapropylammonium at 50-70% neutralization was 20-25% for 0.003-0.01 M polymer, about 4% in 0.001 M solutions. These data indicate that a significant fraction of even large counter-ions are close to the chain.

Conductometric titrations showed that the equivalent conductance of the polyanion was about 40 for most of the salts studied and at low values of α. The binding of counter-ions based upon the assumption that this value was constant over α led to values which were in reasonable agreement with those determined by Wall using transport experiments.

Microfilm $2.75; Xerox $6.20. 126 pages.

A STUDY OF THE DIELECTRIC CONSTANT, TEMPERATURE, VISCOSITY, AND CONCENTRATION DEPENDENCE OF THE EQUIVALENT CONDUCTANCE OF ELECTROLYTES. A. PERCHLORIC ACID IN THE WATER-ETHANOL SYSTEM. B. PERCHLORIC ACID IN THE ETHANOL-METHANOL-WATER SYSTEM.

(Order No. 61-3186)

Neal Goldenberg, Ph.D.
University of Arkansas, 1961

Major Professor: Edward S. Amis

The conductance of perchloric acid was measured in water and in mixtures of water and ethanol having approximately the following compositions: 20, 40, 60, 80, and 98 weight per cent ethanol. It was also measured in methanol and ethanol mixtures having the compositions of approximately 20, 40, 60, 80, and 99 weight per cent methanol with each solvent mixture containing 0.3 weight per cent water. Measurements were made at 25.00, 35.00, and 45.00°C. in each solvent for concentrations of perchloric acid ranging from 3×10^{-3} to 2×10^{-4} gram equivalents per liter.

The data for the equivalent conductance of perchloric acid at various concentrations in each of the solvents at each temperature show that perchloric acid follows the Kohlrausch empirical law in all solvent mixtures studied. A comparison of the empirical slopes obtained with the theoretical limiting slope of Onsager reveals that the predicted slopes in the methanol-ethanol-water system follow the Onsager predictions very closely (especially in high methanol concentrations) whereas the slopes obtained in the ethanol-water system show marked deviations with no noticeable trends.

The variation of Λ_0 with solvent composition reveals a very sharp drop in the limiting conductance when 1.4 weight per cent water is added to an ethanol solution. The addition of ethanol to the aqueous solution at first causes a decrease in the limiting conductance (though not of the same order as the addition of water) and then continues to decrease more slowly with further addition of ethanol. In the methanol-ethanol-water system the variation of the limiting conductance with solvent composition in the range from 99.7 weight per cent ethanol to 99.7 weight per cent methanol follows a smooth curve with only slight curvature. However, there are sharp drops at both extremes of the curve when one adds water either to pure methanol or to pure ethanol.

The variation of the limiting conductance with temperature shows that in the ethanol-water system, the slopes become greater as one adds water to the system. In the methanol-ethanol-water system, all of the systems studied have about the same slope.

The viscosity of the ethanol-water system passes through a maximum somewhere between 40-60 weight per cent ethanol. The viscosity of methanol-ethanol system is linear with composition. However, if one adds 0.3 weight per cent water to this system the viscosity is no longer linearly related with the solvent compositions but shows slight curvature resembling the curve of the limiting conductance as a function of solvent composition. Λ_0 as a

function of solvent composition yields a "finger" type curve the point of the finger occurring at the viscosity maximum of the viscosity-solvent composition curve. The variation of Λ_0 with viscosity in the methanol-ethanol-water system yields a curve of slight curvature similar to that of viscosity against solvent composition.

The variation of Λ_0 with dielectric constant shows a complex dependence in the ethanol-water system, but is linear in the methanol-ethanol-water system.

The data are explained on the basis of selective solvation of the hydrogen ion with water. Two types of conduction are used to explain the type of curves obtained, Grotthus and normal type conduction.

Microfilm $2.75; Xerox $4.80. 91 pages.

THE RADIATION CHEMISTRY OF STYRENE AND POLYSTYRENE

(Order No. 61-3752)

Jerome Goodman, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Joseph Steigman

These investigations were undertaken to extend our knowledge of the radiation chemistry of two related and relatively little studied materials.

In the first part of this work, polystyrene labelled with tritium, mostly on the alpha carbon, was irradiated in vacuum with x-rays. The volatile radioactive products were counted and analyzed by gas chromatographic techniques. G values (molecules formed per hundred electron volts absorbed) were obtained for tritiated products, based on energy absorbed only by the labelled monomer units in the polystyrene. These G values would apply to a polystyrene in which each styrene unit had a tritium atom in it. The G's were: G(T), .00047; G(CH_3T), .00018; G for a fraction volatile at dry ice temperature but not at liquid nitrogen temperature (DIV fraction), .00095; G for a fraction volatile at room temperature but not at dry ice temperature (DINV fraction), .0061.

From the extrapolation of values of deuterium isotope effects from the literature, tritium isotope effect values were estimated. G(H)'s of .0022 and .0046 for the alpha hydrogen were thus obtained, and corresponded to G(H)'s of .010 and .020 for the over-all yield. These values may be compared with published values of .045 and .078. By assuming mechanisms for the formation of the other products, it was possible to calculate G's for the products from an unlabelled polystyrene. These G's were: G(CH_4), .00036; G(DIV fraction), .00095 to .21, depending on the mode of formation; and G(DINV fraction), .0061 if none of the product remained in the polystyrene. If only one to ten percent of the DINV products were actually collected, the true G(DINV) would be .061 to .61. The minimum G values obtained for the components of the DINV fraction (based on complete removal from the polymer) were: G(benzene), .0052; G(toluene), .00022; G(ethylbenzene and xylene), .00018, and G(styrene), .00061. The benzene might have arisen from exchange with solvent benzene trapped in the polymer during purification.

Products from the gamma-irradiation of an unlabelled polystyrene (dose 10^8 roentgens) were determined by mass spectrometry and included hydrogen with a G of .041. The detection of a dimer of styrene (G(dimer collected) = .00002) suggested that a significant amount of monomer is formed in polystyrene irradiation.

In dosimetric studies, the products formed in the irradiation of water saturated with benzene were investigated. The phenol produced was found to be accompanied by a material resembling it, previously unreported and giving analytical tests for phenol. The phenol yields in the literature were, therefore, re-examined, and it was determined that up to 21% of the reported G values was actually due to the new material. It was shown that a benzene-water dosimeter could be based on the absorbance of the 345 mμ peak associated with the newly-found material.

Finally, the radiation-induced polymerization of styrene was studied viscometrically and by dilatometry. The polymerization of styrene exposed to x-rays or gamma rays was found to be markedly reduced in the presence of small concentrations of scintillators. Anthracene, p-terphenyl, and diphenylhexatriene were used and had similar effects. Anthracene at a concentration of about one gram per liter reduced the radical yield in styrene by about half.

It was demonstrated that the scintillators did not cause any appreciable reduction in thermal polymerization rates. Therefore the observed effects were not due to simple scavenging of styrene radicals. Our results, along with other data in the literature, suggested that in an irradiated solution containing scintillator, styrene, and benzene, the styrene would be protected by the scintillator and could at the same time be sensitized by energy transfer from benzene to scintillator to styrene. Experimental results were obtained which appeared to support this conclusion.

Microfilm $2.75; Xerox $9.70. 212 pages.

ELECTRICAL CONDUCTIVITY OF SOLID ORGANIC COMPOUNDS

(Order No. 61-3945)

Maung Shwe Htoo, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: W. H. Bauer

The history of electrical conductivity measurements on solid organic compounds such as proteins, dyes, polymers, organic fibers, organic crystals and organic molecular complexes was reviewed. On the basis of this information, it was decided to limit the investigation to white or colorless organic powders since very little data have been reported in this area.

A special three-electrode assembly for measuring electrical conductivity of organic powders was designed and constructed. The design was a modification of the method developed by Amey[141] for plastic materials. By using this method it was possible to measure both volume and surface resistivity values on the same sample.

More than 100 organic powders including saturated aliphatic compounds, unsaturated aliphatic compounds, mononuclear cyclic compounds, polynuclear cyclic compounds, heterocyclic compounds, monomers (for polyelectrolytes), and organometallic compounds were used for

initial conductivity measurements. The purpose was to screen out compounds of very high electrical resistivity and to select low resistivity ($<10^{12}$ ohm cm.) compounds for further study.

The effects of relative humidity, temperature, applied voltage and chemical structure on the electrical conductivity of the selected organic compounds were investigated.

There was a correlation between the mechanism of conduction of the material and its electrical conductivity change with relative humidity. Electrical conductivity of compounds possessing ionic conductivity changed with relative humidity. On the other hand, organic compounds reported to be electronic conductors had constant electrical conductivity regardless of relative humidity conditions.

There was no consistent correlation between the electrical conductivity and chemical structure of organic compounds. Impurities appeared to cause greater changes than chemical structure in electrical conductivity.

Four new organic semiconductors ($<10^{10}$ ohm cm. in volume resistivity) were discovered. They were p-bromobenzophenone, p-chlorobenzophenone, 2,4'-dichlorobenzophenone and p-bromoacetophenone. All of these except p-bromobenzophenone were white. p-Bromobenzophenone was tan. These compounds lost their electrical conductivity on recrystallization indicating that they were impurity or extrinsic semiconductors.

The thermal activation energy of conduction for the four new semiconductors ranged from 0.38 electron volts for p-bromoacetophenone to 1.06 electron volts for p-bromobenzophenone. This was in good agreement with values reported in literature for other organic semiconductors.

Electrical conductivity measurements made at varying applied voltage levels indicated that Ohm's law was valid within the voltage range of approximately 30 to 1600 volt $cm.^{-1}$. Microfilm $2.75; Xerox $7.00. 146 pages.

SPECTROSCOPIC STUDIES IN MOLECULAR STRUCTURE

(Order No. Mic 61-2676)

George Edgar Leroi, Ph.D.
Harvard University, 1961

Research Director: Assistant Professor W. A. Klemperer

I. The Electronic Spectra of Gaseous $CuCl_2$, $NiCl_2$ and $CoCl_2$: Experimental Observation and Crystal Field Treatment. The low resolution absorption spectra of gaseous $CuCl_2$, $NiCl_2$ and $CoCl_2$ have been obtained between 3,500 cm^{-1} and 28,000 cm^{-1}. The observed absorptions have extinction coefficients of the order of 100 liters/mole·cm, suggesting that they correspond to "forbidden" intraconfigurational $\bar{d}^n \leftarrow \bar{d}^n$ transitions analogous to those found in crystals and solutions containing these metal ions. The energy levels predicted by a crystal field treatment assuming $D_{\infty h}$ symmetry for these molecules closely parallel those observed experimentally.

II. The Infrared Spectra and Bonding of Transition Metal Halides. The infrared spectra of several gaseous transition metal dihalides have been obtained, both in absorption and emission, at frequencies greater than 240 cm^{-1}. Some of the bands observed in absorption have been attributed to dimeric molecules. The force constants obtained from the asymmetric stretching frequencies in the monomeric dihalides are compared to those of the corresponding monohalides, and a qualitative explanation of the bonding involved is presented. Force constants derived from a primarily covalent model give rise to a double maximum as the $\bar{d}$ electron shell is filled, which is also shown by the observed quantities.

III. The Infrared Spectra of NaCN and KCN. The infrared absorption spectra of NaCN and KCN have been obtained between 200 cm^{-1} and 4,000 cm^{-1}. For each molecule one band has been assigned to ν_3, primarily the C-N stretching frequency, and another tentatively to the doubly degenerate band. A third absorption in NaCN is attributed to a vibration of the dimeric molecule, and a short discussion of the force constants and bonding in the alkali cyanides is given.

IV. Matrix Isolation and the Search for BH_3. Attempts have been made to observe the infrared spectrum of borane in the vapor above boron metal heated above 2000°K in a hydrogen atmosphere. When these experiments proved inconclusive, further work was undertaken using matrix isolation methods. BH_3CO was condensed in an inert matrix on an infrared transmitting window and photolysed in the solid phase. Indications of some dissociation of the parent molecule were observed, but no positive identification of BH_3 was possible. The general features of the matrix isolation technique are described, and modifications of the present study are suggested which should permit the entrapment of borane. A short discussion of the probable structure and infrared spectrum of BH_3 is also given. Microfilm $2.75; Xerox $7.80. 166 pages.

STUDIES WITH FAST ATOMIC BEAMS OF HELIUM

(Order No. 61-3753)

Joseph Lipsig, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Rudolph A. Marcus

An apparatus has been constructed to produce a high energy atomic beam (500 to 2,000 e.v.) and to study the interaction of this beam with gases and surfaces. The beam source in the apparatus, patterned after that of Lamar and Luhr, consists of an arc section where the beam is formed and of a scattering section where experiments are performed with the beam. The arc section contains a filament which produces electrons, an anode which accelerates them, a cathode that extracts the ions produced by the accelerated electrons, and an atom gun which accelerates the ions to the desired energy. On passing through the atom gun many ions are neutralized to fast atoms of the same energy by the process of charge exchange and this beam of atoms and ions is converted to a pure atomic beam by deflecting plates that remove the residual ions.

Helium gas was used in these experiments. Although the apparatus was designed to produce a homogeneous beam of atoms, the possibility exists that such was not the case. Calculations based on charge exchange experiments indicate that only a small fraction of the beam particles were ions and that the translational energies were not uniform.

An investigation was undertaken of the intensity of the beam. Using an approximate value for the electron ejection ability of the fast helium atoms, it was concluded that the fast helium beam had an intensity of 2.5×10^{11} particles per second. This value is comparable to that which can be estimated from Amdur's work obtained with a thermocouple detector. It also appeared that the intensity of the beam was greater when the arc was operated with the anode shorted to the cathode under the particular conditions used.

A study was made of the interaction of the helium beam with a copper surface. It was found that electrons and ions (or metastable atoms) were produced in this interaction. Evidence is presented that this production of ions is similar to the reflection of ions when ionic beams strike a surface.

Using the data obtained here and data obtained by ionic beam experiments, the various possible physical mechanisms responsible for the production of ions are discussed. It is believed by this author that these particles are not ionized by massive collisions at the surface by beam particles striking the surface atoms nor that charge exchange at the surface is responsible for the reflection of ionic beams. Rather the data are best correlated with the proposal that the ejected surface atoms are excited by the ejected electrons and then undergo resonant ionization.

The possibility of resonant ionization taking place in this system of helium and copper is discussed and it is shown it is possible using potential energy curves for the interaction of helium metastable atoms and helium ions with copper.

The effect of pressure on the ratio of electrons ejected to ions ejected was investigated. It was found that the ratio increased when the helium background pressure increased. This is thought to be due to the greater probability of helium atoms striking sorbed helium atoms and the consequent reduced production of excited atoms at the surface.

An investigation was also made of the production of a blue color on molybdenum trioxide when bombarded with helium atoms. One possible origin is that the sorbed gases were being dissociated by the beam atoms and the free radicals produced were reacting with the molybdenum trioxide. Another cause is that the beam atoms were directly inducing a chemical change in the molybdenum trioxide itself. Microfilm $2.75; Xerox $5.00. 96 pages.

ADSORBED MONOLAYERS OF POLAR AND NON-POLAR MOLECULES ON A GRAPHITIZED CARBON BLACK

(Order No. 61-3949)

William Dean Machin, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Sydney Ross

Adsorption isotherms of CCl_4, $CHCl_3$, and $CFCl_3$ on P33(2700°), a graphitized carbon black, have been measured at various temperatures above and below the two-dimensional critical temperature. The isotherms, in all cases, may be described by a two-dimensional van der Waal's equation.

Thermodynamic analysis of the data shows that the adsorption may be explained in terms of two different models, one of which assumes the molecules to be freely rotating and moving freely in two dimensions, and the other assumes that the adsorbed molecules have lost rotational movement about two molecular axes parallel to the surface of the adsorbent and also moving freely in two dimensions.

In the former model the vibrational frequency of the adsorbed molecule must be of the order of 10^{13} sec^{-1}, and in the latter case the vibrational frequency is about 10^9 if there are no lateral vibrations, and about 10^{12} if there are two such vibrations.

The van der Waals' attractive forces between adsorbed molecules are found to be less than would be expected, and two approaches are used to examine the source of this decrease.

The polarization theory assumes that an electric field existing above the surface of the adsorbent, induces dipoles in the adsorbed molecules, and that the resulting dipole - dipole repulsion accounts for the decrease in the intermolecular attractive forces.

Application of this theory to the present data shows that a single value of the surface electric field can account for the decrease in the intermolecular attractive forces, and the potential energy of adsorption, as derived from this theory, is adequately explained.

The charge-transfer, no-bond theory of adsorption also accounts for the decrease of intermolecular attractive forces and also yields a potential energy of adsorption in good agreement with the observed potential energy of adsorption. Microfilm $2.75; Xerox $5.80. 116 pages.

TRANSPORT PROCESSES IN LIQUIDS

(Order No. 61-3755)

Gerald Mandel, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Frank C. Collins

The derivation of Collins and Raffel for the steady state frictional force acting on a molecule with a known velocity in a liquid is revised and placed on a more rigorous basis. An alternative derivation, based upon a perturbation series treatment, is given for the general case of a molecule

relaxing from a known velocity. The latter enables the velocity dependence of the frictional coefficient to be examined. A numerical evaluation of the corrected velocity-dependent frictional coefficient for liquid argon averaged over all velocities is in improved agreement with the value calculated from experimental self-diffusion data for liquid argon.

The perturbation series treatment is applied to the theory of transport processes in liquids. This allows not only an evaluation of the transport coefficients in terms of integrals over the intermolecular pair potentials and phase densities but also a formulation of each of the transport coefficients in terms of the others. The relation between the frictional coefficient and the viscosity coefficient is virtually identical to that derived by Ottar on a kinetic basis. This relation is shown to be in good agreement with experiment.

Upon the assumption that the motion of an ensemble average molecule may be treated as a single particle problem, it is seen that a heuristic quantum treatment of the transport processes in a liquid based upon a form of the Uncertainty Principle leads to a relation between the hydrodynamic frictional coefficient and the temperature at the freezing point. This relation is shown to be in good agreement with experiment for several liquids.

Microfilm $2.75; Xerox $3.60. 63 pages.

STRUCTURE AND INFLUENCE OF INTERPHASES AT THE AIR-WATER AND OIL-WATER INTERFACES

(Order No. 61-3894)

Jean Bernard Montagne, Ph.D.
Columbia University, 1961

The formation of interfacial structures was studied at the air-water and at the oil-water interfaces by surface chemical techniques.

Actions of Calcium and Magnesium ions in solutions on stearic acid films have been compared; the presence of such ions could be observed down to concentrations of 0.2 p.p.m.

Solutions of straight chain polyphosphates were found to produce brittle and poorly expanded two-dimensional surface lattice structures at the air-water interface when Calcium or Magnesium was present to adlineate phosphate groups with fatty acid monolayers spread at the air-water interface at the right pH.

Solutions of amino alkyl alcohols provided markedly more expanded ($A > 100$ Å^2 per molecule), coherent and elastic structures: these enabled the monolayers or mixed films at the oil-water interface to be penetrated by the hydrocarbon molecules and thereby produced negative "total interfacial tensions." These tensions are responsible for self-emulsification and thermodynamical stability of some micro-emulsion systems, in good agreement with previous studies on the stability of such systems.

The latter structures were formed by H-bonds between adlineated - OH groups belonging to alkyl alcohol molecules adsorbed to the fatty acid molecules by amino groups.

For the first time, experimental evidence was given for such negative interfacial tension values by superimposing a positive tension (due to the presence of an oil-air interface) to preserve the existence of an oil-water interface.

Microfilm $2.75; Xerox $4.80. 95 pages.

PART I: IONIZATION EQUILIBRIA OF MONO-p-METHYL AND MONO-p-TRIDEUTERIO-METHYL TRIPHENYLCHLOROMETHANE IN LIQUID SULFUR DIOXIDE. PART II: SPECTROPHOTOMETRIC AND CONDUCTANCE STUDIES OF SOME TRIPHENYLCHLOROMETHANE DERIVATIVES IN NITROBENZENE AT 25°.

(Order No. 61-3380)

Elton Price, Ph.D.
Boston University Graduate School, 1961

Major Professor: Norman N. Lichtin

Part I

The work described in this dissertation was undertaken to investigate the isotope effect on an equilibrium which is closely related to the assumed equilibria between reactants and transition states in solvolytic reactions and aromatic substitution. Earlier studies of the ion-forming equilibria of triphenylchloromethane and many of its o-, m-, and p-substituted derivatives together with data on the dissociation equilibria of many ionophores have provided a convenient means of evaluating substituent effects on the ionization equilibrium: $Ar_3CCl \overset{SO_2}{\rightleftharpoons} Ar_3C^+Cl^-$ (1).

The similarity of substituent effects in this system to those observed in solvolytic reactions (2,3) and electrophilic substitution reactions (4) has been elegantly demonstrated by Brown and Okamoto (5). Lewis and Boozer (6) suggest that β-deuterium isotope effects observed in the solvolysis of secondary alkyl halides and tosylates are dependent in part on the requirements of the developing carbonium ion for internal electron supply at the transition state. Studies of the ionization equilibrium above provide a measure of substituent effects where full carbonium character is unequivocally developed.

The secondary deuterium isotope effect on the ionization equilibrium, $p\text{-}CH_3\text{Ø}C\text{Ø}_2Cl \overset{K_1}{\rightleftharpoons} p\text{-}CH_3\text{Ø}C^+\text{Ø}_2Cl^-$ due to replacement of CH_3 by CD_3 could not be properly evaluated by determination of the equilibrium constant for free ion formation, $K_{exp.}$, from conductance data with the aid of Shedlovsky's procedure because of the large uncertainty in the calculated magnitude of this constant, E.g., $10^4 K_{exp.}$ for the compound containing 2.43 atoms of D per molecule was found to be 6.65 ± 0.37, indistinguishable from values of 6.47 ± 0.54 and 6.25 ± 0.68 determined with two independently prepared samples of the protium compound. The indicated uncertainties are based on variance calculations with 95% confidence limits.

By taking advantage of the identical ionic conductances of the deuterated and unlabeled cations, it was, however, possible to evaluate the isotope effect more precisely from

conductance data at dilutions around 600 liters mole^{-1}. The isotope effect, $(K_1)_H/(H_1)_D$, was found in this way to be very small, having an estimated value of 1.003 ± 0.005 per D atom. This value and the indicated uncertainty are based on the mean magnitude and standard deviation of the ratio, $(\Lambda_H/\Lambda_D)_c$, of measured equivalent conductances at given concentration in the range from 500 to 700 liters mole^{-1}, 1.0020 ± 0.0029 for 2.43 atom D per molecule.

The development of full carbonium ion character is not associated in the present case with a significant secondary isotope effect.

Part II

The spectrophotometric results on ion-pair dissociation of triarylchloromethanes reported by Evans and coworkers (7,8) are inconsistent with the theory of electrostatic ionic association (9,10) and conductance data in solvents of high dielectric constants, e.g. nitromethane and nitrobenzene. These workers concluded that the only equilibrium involved in these solvents is between the covalently bonded molecules and ion pairs. The work described in this dissertation was undertaken to reinvestigate spectrophotometrically and conductometrically the equilibria $Ar_3CCl \overset{K_1}{\rightleftharpoons} Ar_3C^+Cl^- \overset{K_2}{\rightleftharpoons} Ar_3C^+ + Cl^-$ in nitrobenzene at 25°.

Nitrobenzene was chosen as the solvent because of its relatively high dielectric constant (D_{25} = 34.5) and its expected chemical inertness towards the solute. In this study, the final degassing and distillation of solvent and the preparation of solutions were carried out on the high vacuum line under an atmosphere of solvent. Absorbance and electrical conductivity were determined on the same solution in cells which had been sealed under vacuum. Free ion concentrations were calculated from conductivity data while the sums of free and associated ion concentrations were calculated from absorbances.

Triphenylchloromethane and its mono-p-methyl derivative are measurably ionized at stoichiometric concentrations in the range 0.0007 M to 0.015 M, but the degree of ionization is too small to determine with any accuracy. The degree of ionization in a 6.2 x 10^{-4} M solution of tri-p-t-butylphenylchloromethane is less than .01 and the free ion concentration is indistinguishable from the total ion concentration.

More conclusive results were obtained with solutions of tri-p-anisylchloromethane. Conductivity data were obtained in the concentration range 4.55 x 10^{-5} to 8.8 x 10^{-4} M where the absorbance was too large to measure accurately. The limiting equivalent conductance, Λ_0, and the equilibrium constant, $K_{exp.}$, were found by Shedlovsky's procedure to be 31 ± 3 mho cm.^{2} mole^{-1} and (4.2 ± 1) x 10^{-5} mole 1.$^{-1}$, respectively. It was found that, in solutions up to 1 x 10^{-5} M in carbonium ion, the concentration of free ions is indistinguishable from the total ionic concentration. This result conflicts with that of Evans et al. (8) who report only paired ions in 10^{-6} to 2 x 10^{-5} M solutions of triaryl carbonium ions in nitrobenzene.

It is concluded from the work reported in this dissertation that the ions formed in very dilute solution are not detectably paired.

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Microfilm $2.75; Xerox $8.60. 190 pages.

THE CRYSTALLINE STRUCTURE OF POLY (ETHYLENE OXIDE) AND THE CHARACTERIZATION OF ISOTACTIC POLY (EPICHLOROHYDRIN)

(Order No. 61-3547)

John Russell Richards, Ph.D.
University of Pennsylvania, 1961

Supervisor: Robert E. Hughes

A program was conducted to elucidate the distribution of matter in crystalline poly (ethylene oxide) utilizing x-ray diffraction. A preliminary investigation was conducted into the solution properties and crystal structure of isotactic poly (epichlorohydrin).

A high molecular weight (1X10^7) sample of PEO was purified and formed into an oriented, annealed fibre. A series of x-ray diffraction photographs were taken at 25°C. in cylindrical cameras. The density of the PEO was determined by the method of hydrostatic weighing to be 1.202 ± 0.002 gm./cc. Normal-beam rotation photographs were analyzed to give the following monoclinic unit cell dimensions: a = 8.03 ± 0.06 Å; b = 13.09 ± 0.06 Å; c = 19.52 ± 0.13 Å; β = 125°8' ± 22'. The average percentage deviation of all the calculated d spacings was 0.37. The observed intensities were corrected for multiplicity, superposition, Lorentz and polarization effects, arcing errors, and isotropic temperature vibration effects. The observed space group is probably Pa and the structure approaches $P2_1/a$ upon annealing under tension. Best

packing arguments for continuous uniform helices and discontinuous helices were developed. Six independent criteria for the helix type, u_t, being 7_2 were formulated.

The constraints used to solve for the intra-helical structure were bond angles, bond lengths, 7_2 helical symmetry, and a dyad passing through the oxygen atom. The bond lengths of C-C, C-O, and C-H were respectively taken to be 1.54, 1.43, and 1.09 Å. The bond angles of O-C-C, C-O-C, and H-C-C were respectively set equal to 109°28', 111°, and 109°28'. The minimum intrahelical H-H distance for hydrogen atoms not bonded to the same carbon atom was 2.38 Å. The internal cylindrical coordinates of the helical atoms were determined. The radii of atoms O, C. H_1, and H_2 were, respectively, 0.548, 1.568, 2.444, and 2.067 Å. The angular positions of the same atoms were 0, 29.97, 38.58, and 3.72°. The z coordinates were 0, 0.880, 0.303, and 1.401 Å. The residuals of layer lines 0, 1, 2, and 4 were respectively 0.055, 0.81, 0.088, and 0.164. Many possible explanations of the discrepancy on the first layer line were investigated. The majority proved to be insufficient, in themselves. Effects which could explain the anomaly, but which were considered to be too difficult to analyze properly were, a coiled-coil structure and inter-helical distortions which preclude 7_2 symmetry, except as a first approximation.

Poly (epichlorohydrin) was prepared by the reaction of racemic monomer with a zinc chloride - aluminum isopropoxide catalyst at 80°C. for 24 days. The crystalline isotactic polymer was separated from the amorphous. The intrinsic viscosity of the vacuum dried amorphous polymer was 0.13 in tetralin at 25°C. A dilatometric study was conducted on the isotactic polymer. The melting point was 121 ± 1°C. The relationship between the specific volume of the amorphous polymer and the temperature was determined to be: $(S.V.)_{am.} = 0.00056\ T(°C.) + 0.7154$ ml./gm. The solubility parameter was found to be 9.4 $(cal./cc.)^{\frac{1}{2}}$. The orthorhombic unit cell dimensions of the isotactic polymer was: a = 12.14 Å, b = 4.90 Å, c = 7.07 Å (fibre axis). The weight percent crystallinity was 21%. The space group could either be $P2_12_12_1$ or $Pna2_1$. This ambiguity is the same as that arising in the probably isomorphous structure of isotactic poly (propylene oxide). Further work to determine atomic positions is planned.

Microfilm $2.75; Xerox $5.40. 108 pages.

THE LATTICE GAS AND THE CELL-VACANCY THEORY OF LIQUIDS

(Order No. 61-3757)

Abdel Salam Said, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Frank C. Collins

The cell-vacancy theory of liquids of Peek and Hill has been reinvestigated in two respects. The treatment of the combinatorial part of the problem has been simplified and methods outlined for its refinement. The effect of neighboring vacancies on the cell potential function has been more accurately introduced with resulting improvement in the calculated cell density function.

The combinatorial aspect of the cell vacancy theory is equivalent to the order-disorder problem. The quasi-chemical approximation method of handling this problem was developed by Guggenheim on the basis of the law of mass action. It has been reformulated by a generalization of the one-dimensional Ising method to two and three dimensions. The equations resulting from the new treatment, while equivalent to those of Guggenheim are cast into particularly simple formulas which greatly facilitate the obtaining of numerical values in contrast to the complicated formulas of the final equations of the original version of the theory. A striking result of the new formulation is that the probability of finding a molecule at a site known to be occupied is identical with that in the one-dimensional Ising method.

A method for handling the next higher approximation involving correlations among triplets of lattice sites is derived using an analogous formalism. The numerical handling of the triplet problem is made feasible by the introduction of the superposition hypothesis, well known in the theory of liquids. The probability of finding a molecule next to a site known to be occupied is not greatly different numerically from that in the quasi-chemical and Ising model. For the face-centered cubic lattice, the calculated pressure in the triplet case, however, is very nearly equal to that found in the quasi-chemical approximation. The pressure for other lattice types may differ considerably from that for the quasi-chemical case, as indicated by data obtained for the two-dimensional triangular lattice. The data suggest that the critical temperature for the two-dimensional lattice will be significantly lower than that obtained for the two-dimensional case by the quasi-chemical method.

The Peek and Hill method of spherically symmetrizing the effect of a neighboring vacancy on the cell potential is replaced by a calculation in which the effect of the vacancy is left in angularly dependent form. The principal contribution of a vacancy to the density function in the adjoining cell lies in the immediate neighborhood of the vacancy. Account is inadequately taken of this circumstance if the corrected cell potential is spherically symmetrized. After the more precise determination of the cell density from the non-spherical cell potential, the cell density can be spherically symmetrized without introducing significant error, for facilitating the calculation of the thermodynamic properties. The equilibrium fraction of cell vacancies and the thermodynamic properties resulting from the refined treatment are in better agreement with experiment than those calculated by Peek and Hill.

Microfilm $2.75; Xerox $4.60. 87 pages.

THE OXIDATION OF SYM-DIETHYLDIBORANE

(Order No. 61-3953)

Erik Iver Sandvik, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Dr. Stephen E. Wiberley

The gas phase oxidation of sym-diethyldiborane has been studied under both explosive and non-explosive conditions.

The non-explosive partial oxidation has been studied in the temperature region from 40° to 80°C in Pyrex bulbs with break-seals. The over-all reaction observed in the partial oxidation is:

$$(C_2H_5BH_2)_2 + 2\ O_2 \rightarrow 2\ C_2H_5OBO + 2\ H_2$$

Comparison of the relative rates of sym-diethyldiborane consumption, oxygen consumption and hydrogen formation indicates that two intermediate partial oxidation products are present. These were not isolated as pure compounds, but a mass spectrum of an impure mixture indicates that at least one of these compounds has a peroxide structure.

The rate of disappearance of sym-diethyldiborane in the partial oxidation was found experimentally to be zero order in oxygen and first to three-halves order in sym-diethyldiborane. This rate was found to have a temperature dependence corresponding to an activation energy of 32.5 ± 1.5 kilocalories per mole.

The products of explosions with mixtures of 9 oxygen to 1 sym-diethyldiborane were observed to be carbon dioxide, water and a white solid, presumably boric oxide, B_2O_3. A well defined explosion limit for 9 oxygen to 1 sym-diethyldiborane mixtures in 6.8 cm bulbs coated with reaction products was observed. No multiple explosion limits, characteristic of chain branching explosions, were seen. The observed explosion limit was not in complete agreement with the theory of thermal explosions originally developed by Semenoff. However, the effect of helium and argon on the explosion pressure clearly indicates that the mechanism causing explosion is primarily thermal.

The over-all order of the reaction leading to explosion was estimated from the variation of explosion pressure with bulb diameter at constant temperature. The over-all order was found, as was the case in the non-explosive oxidation, to be in the region from first to three-halves order.

The enthalpy change of the partial oxidation reaction has been estimated, using literature values of bond energies and heats of formation, to be approximately 130 kilocalories per mole. A thermal explosion to form ethyl metaborate and hydrogen would result in a temperature rise to approximately 2000°C which would certainly be above the ignition limits of the mixture of hydrogen, ethyl metaborate and remaining oxygen. Thus the explosive oxidation is believed to be an initial rapid partial oxidation reaction generating enough heat to cause complete combustion.

The following mechanism has been proposed for the partial oxidation:

$$(C_2H_5BH_2)_2 \quad 2\ C_2H_5BH_2$$

$$C_2H_5BH_2 + (C_2H_5BH_2)_2 \leftrightarrows (C_2H_5)_3B_3H_6$$

$$(C_2H_5)_3B_3H_6 + O_2 \rightarrow (C_2H_5BHO)_2 + C_2H_5BH_2 + H_2$$

$$(C_2H_5BHO)_2 + O_2 \rightarrow (C_2H_5BHO_2)_2$$

$$(C_2H_5BHO_2)_2 \rightarrow 2\ C_2H_5OBO + H_2$$

$$(C_2H_5BHO_2)_2 + (C_2H_5BH_2)_2 \rightarrow 2\ (C_2H_5BHO)_2$$

The first three reaction steps in this mechanism can give a rate expression three-halves order in sym-diethyldiborane and zero order in oxygen, in agreement with the experimentally observed orders.

Microfilm $2.75; Xerox $5.40. 108 pages.

ACTIVITIES AND VAPOR PHASE CONSTITUTION IN THE MOLTEN SALT SYSTEM KCl-$MgCl_2$

(Order No. 61-3954)

Eugene E. Schrier, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Herbert M. Clark

The vapor pressures of the molten salts KCl, $MgCl_2$ and CsCl have been determined at temperatures between 900°C and 1150°C by the use of a boiling point technique. In this method the temperature of boiling is determined, at a given pressure, as a halt which is observed in the melt temperature in spite of the continued rise of the furnace temperature. The vapor pressures for twelve different mixtures of KCl and $MgCl_2$ have also been determined in the same temperature range. Plots of vapor pressure versus composition exhibit a minimum at all temperatures near the composition 66.7 mole % KCl-33.3 mole % $MgCl_2$.

Vapor analysis was performed on the same salts and mixtures using the transpiration method. These measurements are made by passing an inert gas over a salt sample at a known temperature. The salt vapor entrained by the carrier gas is collected, weighed and analyzed. The transpiration data for the pure salts are combined with the boiling point measurements to yield the average molecular weight, $\overline{M}$, of the vapor. Values of $\overline{M}$ for each salt are relatively constant over the temperature range investigated. Association into dimers is postulated for all the salts studied in this investigation with the vapors of each consisting of approximately 25% dimer and 75% monomer in the temperature range 975 - 1100°C. Equilibrium constants for dissociation of the dimer and heats and entropies of dimerization are calculated for each salt vapor.

A study of the data obtained from transpiration measurements on various KCl-$MgCl_2$ mixtures indicates the presence of the mixed dimer or compound $KMgCl_3$, in the vapor over these mixtures. A model is postulated for the vapor over KCl-$MgCl_2$ mixtures which includes the monomers and dimers of the pure salts and the compound $KMgCl_3$. Combination of the transpiration data with the boiling point measurements allows the calculation of the mole fractions and partial pressures of the components present in the vapor of the system. The calculation of activities from these data is limited to values for $MgCl_2$ in the range of liquid compositions, 0 - 42.9 mole % KCl and for KCl, to the liquid compositions 67.2 - 100 mole% KCl. These data are compared with those of other investigators who used different methods, and with the model of Flood and Urnes for the system which postulates that the melt is made up of the ions, K^+, Mg^{++}, $MgCl_4^{-2}$ and Cl^-.

Microfilm $3.75; Xerox $13.30. 292 pages.

ON THE CRYSTALLOGRAPHY OF A HIGHER BORIDE OF ALUMINUM; THE CRYSTAL STRUCTURE OF HEXAGONAL POTASSIUM 12-TUNGSTOCOBALTIATE; AN ABSORPTION CORRECTION FOR THE BUERGER PRECESSION CAMERA.

(Order No. 61-3386)

Nicholas Francis Yannoni, Ph.D.
Boston University Graduate School, 1961

Major Professor: Klaas Eriks

The crystal structure of an aluminum boride with a high boron content, "αAlB_{12}," has been investigated. X-ray diffraction photographs of levels zero to seven were obtained using Weissenberg equi-inclination techniques on a crystal rotating about the b-axis. The tetragonal unit cell axes are a = b = 10.17 Å, and c = 14.28 Å. The space group is $P4_12_12$ or its enantiomorph $P4_32_12$. The number of formula units per unit cell, calculated using the experimental density of 2.55 g./cc., is 14.4.

This investigation has indicated that the stoichiometry of the compound is possible AlB_{11} rather than AlB_{12}. The number of formula units of AlB_{11} per unit cell, based upon the density mentioned above, is 15.6. This figure is more compatible than 14.4 with the space group symmetry which requires the number of formula units per unit cell to be a multiple of four.

A trial model of the structure, consisting of boron icosahedra in which one boron atom per icosahedron is replaced at random by an aluminum atom, was subjected to least squares refinement on an IBM 704 computer. The discrepancy factor for 188 general reflections was reduced to 0.35 after twelve cycles of refinement.

Since the minimum discrepancy factor for other trial models was 0.60, the atomic arrangement obtained by the least squares process is considered to be a close approximation to the correct structure at the present time.

Future work requires the computation of three-dimensional electron density maps and least squares refinements which include all of the 1050 possible independent reflections.

The crystal structure of potassium 12-tungstocobaltiate, $K_5[CoW_{12}O_{40}].20H_2O$, has been determined. There are three molecules in the hexagonal unit cell. The axes are a = b = 19.11 Å., c = 12.54 Å. and the space group is $P6_222$ or its enantiomorph $P6_422$.

The anion contains twelve tungsten atoms arranged at the corners of a slightly distorted cube-octahedron. Each tungsten atom is surrounded by an irregular octahedron of oxygen atoms. The cobaltic ion is located at the center of the anion, and its four nearest neighbors are oxygen atoms situated at the vertices of a distorted tetrahedron. This is the first compound in which the cobaltic ion has been found in a tetrahedral environment.

The anions are arranged in a helix which spirals about the c-axis. The large channel at the center of the spiral contains water molecules and potassium ions.

The discrepancy factor, based upon position parameters for all atoms, anisotropic temperature factors for the tungsten atoms and individual isotropic temperature factors for all remaining atoms, is 0.152 for the combined hkO and Okl zones.

Standard deviations in the parameters are estimated at 0.01 Å. for tungsten atoms and 0.15 Å. for oxygen atoms. Calculations of interatomic distances in the anion have shown that some of the distances between the tungsten atoms and the outer oxygen atoms are extremely short. These are discussed in terms of polarization of the outer oxygen atoms. The distortion of the central tetrahedron of oxygen atoms which surrounds the cobaltic ion is discussed on the basis of the Jahn-Teller theorem.

An absorption correction for use with the Buerger precession camera has been developed. It is designed for 30° precession angle zero-level photographs of spherical or cylindrical crystals.

Based upon the geometry of the precession method, equations have been derived for the calculation of the two quantities needed to permit the use of tabulated values for absorption corrections. These quantities are (a); the average path-lengths of the x-ray beam through the crystal, and (b); the vertical angle between the diffracted beam and a horizontal plane containing the incident beam and the crystal rotation axis. Both of these quantities are developed as functions of the position of the reflection on the film.

The application of the correction with the use of high-speed digital computers is discussed. Graphs are presented to permit the use of the correction when such computational facilities are not available.

Microfilm $2.80; Xerox $9.70. 214 pages.

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ECONOMICS, GENERAL

THE IMPACT OF TECHNOLOGICAL CHANGE ON RAILROAD EMPLOYMENT, 1947-1958.

(Order No. 61-3118)

Edward Benedict Jakubauskas, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor L. Reed Tripp

1. Statement of the Problem

Railroad carriers since the end of World War II have been investing heavily in new technology in an effort to reduce labor costs and meet competition in the transportation industry. With a declining level of output, technological change has reduced employment in many railroad occupations, while in others some new job opportunities have been created. The purpose of this thesis is to evaluate the changes in railroad employment particularly as they have been affected by changes in efficiency brought about by new technology and work methods.

2. Procedure

A model of the industry's employment pattern from 1947 to 1958 has been presented, in which the class I railroad carriers have been combined for purposes of analysis. The 128 occupational divisions used by Interstate Commerce Commission have been re-combined into 36 related groups. The employment trend of each occupational group has been analyzed in relation to: (1) the type of output generated by each occupation (passenger-miles, freight ton-miles, or a composite of the two) and (2) the changes in employment attributable to efficiency. An "index of structural change" has been constructed for each of the 36 occupational groups, to measure the impact of technological change. The changes in employment have been related to the experience of railroad workers in terms of: (1) unemployment (2) retirements (3) age characteristics.

3. Results

Technological change has had a particularly significant impact in reducing employment for the unskilled laborer jobs in the railroad industry. In addition, many skilled shop craft jobs have been eliminated. Of the 36 groups analyzed, 5 have experienced growth, 20 stability, while significant declines were noted for 11 groups. Although attrition has cushioned the changes to some extent, technological change has proceeded in the railroad industry at a time of generally high unemployment. The effect of technological change has been particularly severe on older workers in the affected occupations.

4. Conclusions

Fiscal and monetary policies by themselves cannot cope with the employment problems of occupations that have experienced drastic declines in employment. Particular employment and worker categories face especially difficult job reabsorption obstacles following displacement from a declining industry, suggesting devices as follows:

(1) Unemployment compensation benefits combined with re-training provisions for workers in certain occupations. Re-training and re-location benefits to enable manpower resources to be transferred to areas of greater need for surplus labor.

(2) A system of "area-wide" job-rights in the railroad industry to facilitate the mobility of workers on new jobs, to enable the market mechanism to allocate manpower more efficiently.

Microfilm $3.20; Xerox $11.25. 248 pages.

THE ECONOMY OF THE ISRAELI KIBBUTZ: A STUDY OF KIBBUTZ PRODUCTIVITY AND PROFITABILITY AND THE POSITION OF THE KIBBUTZIM IN THE ECONOMY OF ISRAEL.

(Order No. 61-3441)

Eliyahu Kanovsky, Ph.D.
Columbia University, 1961

The central theme of the dissertation is an analysis of the relatively high degree of productivity in the kibbutzim (Israeli collectives) and the relatively poor profitability, within the context of the economy of Israel. The first chapters provide the necessary background for an understanding of the economic problems with which the kibbutzim must contend. This includes a discussion of Israeli agriculture, its various sectors and their production, and the changing position of agriculture in the national economy; a historical sketch of the kibbutz movement; a description of the institutional framework of the kibbutzim, including the various kibbutz federations; the allocation of resources; the radical changes in kibbutz consumption levels; and, the finances of the kibbutz.

The place of the kibbutzim in the Israeli economy underwent considerable change. The moshavim (cooperative) have superseded them as the main form of agricultural settlement. Nevertheless, the high level of investment in the kibbutzim has helped them maintain their strong position in agricultural production. However, they have been increasingly turning towards an emphasis upon nonagricultural enterprises.

The greater productivity of the kibbutzim is due to many factors, primarily, economies of scale, specialization,

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and a high level of investment. They concentrate primarily upon those areas of production which are capital-intensive. The declining attraction of the collectives for Jewish youth, and the exodus of veteran members has brought about serious labor shortages and hence a greater emphasis upon mechanization.

An analysis of their accounts indicates that, at least since 1953, the kibbutzim have been sustaining losses. Though the situation varies, this generalization would apply even to the established older collectives (excluding all those founded after Israel's independence in 1948). Many kibbutzim were settled in areas of poor soil, inadequate rainfall, difficult climate, distant from the markets, and of high cost of irrigated water. Since the collectives started without any capital of their own, and since the initial investment capital provided by the Jewish Agency and the Government Development Budget was inadequate and unsuitable for the investment projects, the kibbutzim increasingly resorted to high cost short-term loans which have had a cumulative negative effect upon their profitability. Agricultural subsidies have not offset the adverse parity index. The exodus from many kibbutzim has raised production and consumption costs (both of which are closely related in the kibbutz). The emphasis of the collectives upon diversification has also had the effect of increasing costs, especially since the labor shortage and the ideological conviction which opposes the use of hired labor has restricted the possibilities of economies of scale.

Under the kibbutz setup, labor costs are determined by the percentage of the membership working in production and by the consumption costs of the settlement as a whole, hence their consumption patterns -- especially in the area of child care -- and the radical improvement in the levels of consumption in the 1950's have a constant negative effect upon the profitability of the economy of the collectives. A specific comparison of the two main forms of rural settlement, the moshav and the kibbutz illustrates many of the problems of the collectives. Since 1957 the number of members of both groups has been declining. While the rural-urban movement of population is typical of developing and developed countries, the exodus from the moshavim need not affect the profitability of the remaining moshav farmers; the effect upon the kibbutz is definitely detrimental.

There are many sociological and political factors which are of basic importance to an understanding of the kibbutz movement. This dissertation addresses itself to an understanding of its economic problems.

Microfilm $4.05; Xerox $14.20. 314 pages.

PRICE AND QUANTITY TRENDS IN THE FOREIGN TRADE OF THE UNITED STATES

(Order No. 61-3891)

Robert Edward Lipsey, Ph.D.
Columbia University, 1961

The primary contribution of this study is the construction of a new set of price and quantity measures covering the period 1879 to 1923 for total U.S. exports and imports and a variety of commodity classes. We use these indexes, in conjunction with previously available data for later years, to examine long-term trends in trade against the background of the development of the American economy and the trade of other areas.

There appears to have been no long-term trend in U.S. terms of trade since 1879, although there have been very wide swings. U.S. terms of trade since World War II have been at almost the same level as before World War I. However, they have been improving since 1951.

On the terms of trade between primary and manufactured goods, the preponderance of U.S. data was contrary to the accepted view that primary product prices have declined relatively in the long run, although the evidence was somewhat mixed. Manufactured products in U.S. trade became cheaper relative to primary products rather than more expensive, particularly before World War I. The purchasing power of U.S. manufactured exports fell with respect to both exports and imports of primary products, and the purchasing power of U.S. primary product exports over manufactures increased.

The decline in price of U.S. manufactured exports relative to agricultural exports could be accounted for mainly by the fact that manufacturing productivity advanced at a more rapid rate that agricultural productivity, particularly before World War I. The reversal of the productivity relationship since World War II has been accompanied by a reversal of the price relationship as well.

These productivity data suggest that declining long-run net barter terms of trade are far from a certain sign of declining real income, and that they may well represent growing productivity and competitiveness. This impression is confirmed by the frequency with which declines in relative prices are associated with growth in relative quantities. This negative price-quantity relationship appeared not only between agricultural and manufactured exports but between agricultural and manufactured imports, between exports and imports of agricultural products, and between exports and imports of manufactures. Similarly, the growth of U.S. exports of textiles and total manufactured products relative to those of the U.K. was accompanied by a relative decline in U.S. export prices for these groups.

These events, taken in conjunction with other evidence of quite pervasive negative relationships between price and quantity changes, suggest that productivity changes were the most frequent cause of long-term relative price movements.

A comparison of the value of exports and imports with the value of domestic output confirmed the view that there has been a decline in the ratio of trade to output. Import ratios have been falling for more than a century while export ratios reached something of a peak in the last half of the nineteenth century before receding.

The volume of trade, however, shows no such long-run decline in importance. Recent export ratios have been among the highest in our record, and import ratios, although they were very low just after World War II, have recently recovered strongly. In 1958-60 they reached the pre-World War I levels, although they have not repeated the higher levels of the interwar years. Thus, in real terms, there is no evidence that the importance of foreign trade has been declining.

Microfilm $5.30; Xerox $18.70. 414 pages.

RECENT INNOVATIONS IN THE WOOLEN AND WORSTED INDUSTRY OF THE UNITED STATES

(Order No. 61-3379)

Benjamin Max Perles, Ph.D.
Boston University Graduate School, 1961

Major Professor: Francis S. Doody

This is an essay about entrepreneurial behavior in the woolen and worsted industry, which is presently in an important period of transition. For many years prior to World War II the industry lay dormant, generating no major fundamental technological or other changes. A significant post-war cluster of innovations materialized, however, which has fomented a revolution, a novel state of affairs for the traditionally conservative industry. In the study of these innovations the approach of J.A. Schumpeter[1] and W.R. Maclaurin[2] has been employed. These men have emphasized the role of innovation in a dynamic economy.

Descriptive material has been written, principally in technical publications, concerning mechanical, chemical, corporate, and locational changes. In areas of this study which are concerned with such description the author has drawn heavily from these sources, providing appropriate documentation. These written sources have been supplemented by the writer's personal observations of the subject matter.

The most significant portion of the work concerns behavior of entrepreneurs. Although some case studies have been made in other industries, it is the belief of the author that this type of research is unique in the woolen and worsted industry. Because of the lack of documentary material concerning entrepreneurial behavior, most of the information has been derived from personal interviews. In every case the principals and their close associates were interviewed. All findings were cross-checked in discussion with other personnel of the concern, few of whom have been given proper documentary credit. It is believed that the case histories present a fair and accurate picture and that the conclusions drawn from these are valid.

Possible innovations of all types in the woolen and worsted industry were investigated. The outstanding innovations, however, have been technological, altering the production process by developing new machinery and new processes as well as new products.

Maclaurin suggests that the following questions be asked where technological innovations are of major importance:

(a) Are major changes occurring in the sciences underlying the industry?

(b) Is engineering art in close touch with and contributing to these advances?

(c) Is the economic organization of the industry conducive to innovation?

(d) Is capital freely available for radical new developments?

(e) Do the entrepreneurs possess the requisite skills for successful innovation?[3]

These questions have been answered for the woolen and worsted industry. Our analysis has been centered on the period following World War II, when the above-mentioned important group of innovations made significant changes in production processes.

The study has revealed no reasonable new hypothesis concerning the timing of innovation in the industry which is capable of simple application. Nor does it provide support for existing theories of innovation. The woolen and worsted industries must be viewed as a special case of "Trustified Capitalism,"[4] where innovation is examined against the background of the existing scene.

Inquiry is made into the reasons for the clustering of innovations during post-World War II years. Such problems are considered as: why particular firms innovated and others did not; who the innovators were within the firm and why they innovated; and the resistances encountered by these innovators. The economic environment for innovation has been examined, including business conditions, labor, taxes, competition, state of technology, and availability of financing.

We have thus analyzed the far-reaching changes in the industry since World War II. There have been more important changes during this period than at any time since the invention of the automatic loom and (excluding this one invention) since the original development of the industry on a factory basis.

1. J.A. Schumpeter, Business Cycles (New York: McGraw-Hill Book Co., Inc., 1939). Also The Theory of Economic Development (Cambridge: Harvard University Press, 1936).

2. W. Rupert Maclaurin, "The Process of Technological Innovation, The Launching of a New Scientific Industry," The American Economic Review, Vol. XL, No. 1, March 1950.

3. W.R. Maclaurin, op. cit., p. 91.

4. J.A. Schumpeter, Business Cycles, op. cit., p. 96.

Microfilm $3.85; Xerox $13.50. 298 pages.

ECONOMIC ASPECTS OF CHURCH DEVELOPMENT IN PUERTO RICO: A STUDY OF THE FINANCIAL POLICIES AND PROCEDURES OF THE MAJOR PROTESTANT CHURCH GROUPS IN PUERTO RICO FROM 1898 TO 1957.

(Order No. 61-3550)

Michael Saenz, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Roland L. Kramer

"Church Growth" is a primary concern of Christian groups the world over. Churches can grow in various ways--in wisdom, in grace, in love, in maturity, in sophistication, in numbers, and in giving. And this growth is affected by a number of factors, e.g., emphases and priorities of each church group, preparation required of full-time workers, the economic and social status of church members, financial policies and procedures, evangelistic fervor, intellectual interests, and economic development of the area.

Most of these kinds of growth cannot be separated from the others as indicative of general, over-all growth. Most

of the types of growth, and several of the factors affecting growth, are too subjective for scientific study.

Therefore, the author has chosen to study growth in numbers and in giving as affected by the factor of financial policies and procedures. These types of growth lend themselves to objective inquiry, and can be used as some indication of the more subjective types of growth.

The area used to obtain data is Puerto Rico, and the Protestant Church Groups studied are the American Baptist, Congregational-Christian, Disciples of Christ, Episcopal, Methodist, Presbyterian USA, Seventh-Day Adventists, United Brethren, and the United Lutheran Church in America.

Consideration was given to current policies and procedures in financial administration of each church group. Groups with a great deal of authority vested in the missionary board outside Puerto Rico are the Methodist, Presbyterian USA, Lutheran and Episcopal Churches. Groups whose financial matters are planned and administered largely by Puerto Rican administrative groups, with more responsibility resting with the local congregations are the American Baptist, Congregational-Christian, Disciples of Christ, Seventh-Day Adventists, and United Brethren Churches.

Comparisons were made of per capita local contributions and mission board subsidies to reveal in which groups the Puerto Rican Church members had assumed a large share of the financial responsibility for their church work. A per capita total cost of the membership of the several groups was established in order to evaluate the efficiency with which financial resources had been employed to gain increased membership. The data revealed the following information:

Church Group	Per Capita Contributions	Per Capita Subsidies	Per Capita Total Cost
American Baptist	$353	$264	$617
Congregational-Christian	372	399	771
Disciples of Christ	219	179	398
Episcopal	168	911	1,079
Lutheran	270	463	733
Methodist	148	452	600
Presbyterian USA	287	644	931
Seventh-Day Adventists	573	108	681
United Brethren	247	443	690

The conclusions were as follow:

1. That there exists a relationship between financial policies and procedures and church growth and development which can be traced among the major Protestant groups in Puerto Rico.

2. That that relationship is characterized by greater growth and development in the cases in which church work has been made the economic responsibility of the "mission area," and has been placed under local financial administration.

3. That the church groups most likely to attain financial independence from their mission boards are those with an organizational pattern in which the ultimate authority for financial planning and administration rests with the local congregation.

4. That the total per capita cost of the mission enterprise is lower when the economic responsibility and administration are placed with the local (mission) churches which seems to indicate that this results in a more efficient use of a church's economic resources.

Microfilm $2.75; Xerox $9.25. 201 pages.

LOW INCOMES IN URBAN AREAS

(Order No. 61-3906)

Eleanor M. Snyder, Ph.D.
Columbia University, 1961

This study, financed by the Franklin D. Roosevelt Foundation, was undertaken to fill in some of the gaps in current knowledge of the low income population in urban United States. Basic questions posed were: who are the low income people and what are their outstanding characteristics? What fraction of the total urban population do they represent? And, why are their incomes low?

The basic data source for the analysis consisted of special tabulations from the 1950 Survey of Consumer Expenditures, Incomes and Savings of the Bureau of Labor Statistics. From these data it was estimated that one third of all urban families and nearly one-half of all urban single consumers had money incomes that were below the cost of a minimum-level budget for self-supporting families. (Costs in 1950 of the BLS City Workers' Family Budget, and the companion budget for elderly couples were used as the budget standards.) These families and individuals comprise the total group classified as having "low current incomes." Via a procedure that drew upon known income-consumption relationships, a set of discriminants was applied to subdivide the low income families and individuals included in the survey sample into two groups — those with incomes only temporarily depressed, and those whose customary annual income, as well as their income in 1950 was low. The latter group can thus be said to have a low permanent component of income and little or no transitory component and are termed the group with low economic status.

It is estimated that of the total group of urban consumers with low current incomes in 1950, half of the families and about 70 percent of the single individuals also had low economic status. In all, 16 percent of all urban families and a third of the single consumers were considered as members of the group with low economic status. In the aggregate, it is estimated that this economic class includes approximately 20 million persons, of whom over 7 million are young children and 4 million are men and women 65 years of age or older.

In reaching these estimates, families were defined to include all related persons living in a single household; single individuals were persons not living with any relatives. Families so defined thus can include two or more nuclear or biological families, such as elderly parents living with a married son or daughter. Doubled-up units were examined separately to identify low income component families and individuals. By this method of counting, the number of families with low economic status remains the same (nearly 5 million), while the number of single

individuals rises from 1.6 million to 3.7 million. By type, it was found that 14 percent of all urban husband-wife families, 57 percent of one-parent families with young children, 25 percent of all other family types had low economic status, and over 40 percent of the single individuals.

As compared with the rest of the urban population, the group with low economic status includes relatively more families with female heads, more single persons, more of the elderly and more of the larger-sized families. It contains relatively more family heads who had no employment during the year or who were part time or part year workers. Those who were employed members of the labor force had lower average earnings and were concentrated in the lowest paid occupations and industries. Among all families with low economic status, 20 percent were aged, 19 percent were husband-wife families with heads aged under 65 years and not fully employed, and 17 percent were one-parent families with young children. In all, less than half of the heads of families had full employment.

The data derived from the special tabulations of the 1950 BLS Survey of Consumer Expenditures, Incomes and Savings are not published elsewhere.

Microfilm $2.75; Xerox $8.40. 183 pages.

PRODUCT DIVERSIFICATION BY MEDIUM-LARGE MANUFACTURING COMPANIES, 1929-1954.

(Order No. 61-3909)

Jerome Culton Strong, Ph.D.
Columbia University, 1961

A widespread development in American business activity is the appearance of and interest in product diversification. The purpose of this study was to examine the pervasiveness and significance of diversification by determining the amount, the kind, the results, and the causes of diversification on the part of 138 medium-large manufacturing companies during the period 1929-54.

The sample of 138 companies was chosen from the smallest 300 of 1,000 large manufacturing companies arranged according to size by the Federal Trade Commission as of 1948.

In order to determine the amount of diversification, the product descriptions provided by the Standard Industrial Classification were used. Thus, the number of products manufactured by a firm was determined from the number of four-digit SIC categories in which the firm was engaged in each of the three years 1929, 1939, and 1954.

In order to establish the kind of diversification undertaken by the 138 firms, the two-digit "industry group" categories of the SIC were used to see if new products were added in the same, similar, or dissimilar groups.

The results of diversification were examined in terms of the relationships between diversification and size of firm, diversification and asset growth over time, and diversification and rate of profit earned.

Finally, the causes of diversification were examined primarily in the form of the hypothesis that relatively high external rates of profit would induce firms to diversify into areas of production having such high rates.

The conclusions of the study as to the amount of diversification are that a rather small amount took place during the period 1929-39, and a considerably larger amount took place during the period 1939-54, but in both periods large variations existed among companies both within and between industry groups.

As to the kind of diversification, the usual situation was for a company to branch out only into areas that were close to its existing production in terms of technology or markets. The major exceptions involved military products.

As for the results of diversification, non-significant degrees of correlation were found when diversification was compared with size, growth, and profits.

Finally, when the causes of diversification were examined, the apparent, although somewhat inconclusive finding was that diversification was not caused by a deliberate effort to enter high-profit areas, but rather came about as a result of efforts to take advantage of familiar technology or markets.

Microfilm $2.75; Xerox $9.00. 200 pages.

ECONOMICS, AGRICULTURAL

AN ECONOMIC ANALYSIS OF PROGRAMS FOR EXPANDING THE DEMAND FOR FARM FOOD PRODUCTS IN THE UNITED STATES

(Order No. 61-3654)

Martin Erwin Abel, Ph.D.
University of Minnesota, 1961

Adviser: Sherwood O. Berg

In recent years United States agriculture has been characterized by low commodity prices, low farm incomes, and commodity surpluses. This situation has brought forth a multitude of agricultural policy proposals. Among these is the concept of demand expansion or, more particularly, increasing the domestic civilian demand for food in the United States. Since the early 1930's, demand expansion has been a popular idea.

The concept of demand expansion consists of three features:

a) An increase in the consumption of food by consumers in the United States above some given level, which

b) Results from purposive action by society to realize some food consumption goal (e.g., improved nutrition), and which

c) Involves an increased employment of farm resources to meet the food consumption goal.

Three approaches to demand expansion are analysed. They are 1) the income approach, 2) the price approach, and 3) the nutrition approach.

The income approach involves the subsidization of low income consumers for food needs. A Food Allotment Program which grants low income families coupons good for the purchase of foods is analysed under this approach.

The price approach implies a reduction in food prices paid by consumers. A price reduction, as such, is not strictly demand expansion in that it represents a movement along a given demand curve rather than a shifting of the demand curve to the right. If, however, a subsidy is paid to producers -- the subsidy representing the difference between the market price farmers receive and some higher price -- then to producers, the net result is the same as an increase in the demand for their products. An Indemnity Price Program is analysed under this approach. This program operates at the wholesale level of food distribution and subsidies are granted consistent with the desired price declines at the retail level of food distribution.

Under the nutrition approach, institutional feeding programs are examined. Expansion of the National School Lunch and Special Milk Programs are analysed.

For each of the above programs, data on costs of operation and the resulting increases in food consumption and farm resource use are presented for alternative levels of program operation.

The programs will not completely eliminate surplus resources in United States agriculture, even at high levels of program operation and expenditures. However, these programs should be of interest to both agriculture and the general public. To the extent that the programs increase the demand for farm food products, greater resource use in agriculture is obtained. They offer a partial solution to the general overcapacity problem in United States agriculture. Until more effective programs are devised and implemented for solving the surplus problem, partial solutions should not be ignored. In addition, the programs operate to reduce nutritional shortages and the improved health and productivity of the Nation's people is of general public interest.

About $1 billion represents the maximum level of expenditures on demand expansion programs that would be acceptable to the Congress. An expansion of the National School Lunch and Special Milk Programs could raise the level of Federal expenditures to a maximum of $268 million. In addition, operation of the Food Allotment Program at a low level would cost about $550 million and about 10 percent of the total United States population would be involved. Of all the price declines investigated under the Indemnity Price Program, only a 10 percent reduction in the price of meat would result in an acceptable level of expenditures -- slightly over $900 million.

At acceptable total expenditure levels, combinations of the above programs would increase total farm resource use by 2-3 percent -- about one-fourth to one-third of the estimated surplus resources in United States agriculture.

Microfilm $2.85; Xerox $9.90. 219 pages.

AGRICULTURAL TRENDS IN INDIA, 1891-1947: OUTPUT, WELFARE, AND PRODUCTIVITY.

(Order No. 61-3488)

George Blyn, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Richard A. Easterlin

Trends in agricultural crop output, acreage, and yield per acre (and some of its determinants) are analyzed and compared with population growth in British India for the fifty-six year period preceding independence. Eighteen crops, comprising over eighty percent of cultivated acreage, are studied individually and in aggregate groups of foodgrains, nonfoodgrains, and all crops. The trends cover British India as a whole and six regions: Greater Bengal, United Provinces, Madras, Greater Punjab, Bombay-Sind, and Central Provinces. Trend rates, in percentage form, were derived by fitting simple exponential equations to five-year moving averages in each of ten overlapping reference decades, 1891/92-1901/02, 1896/97-1906/07, 1901/02-1911/12, etc. The decade rates are averaged for the whole period and for three sub-periods consisting of the first four, middle two, and last four reference decades.

Primary crop data were obtained from the government's annual Estimates of Area and Yield, and Agricultural Statistics. Coverage of the yield series expanded over time; to provide uniform coverage the unreported yields per acre were estimated for each year and each region, and multiplied by crop acreage, generally available, to obtain output. The reliability of the primary data is examined; for the purpose of indicating trends they are in aggregate considered sufficiently reliable, since the degree of error, generally underestimation, is believed to have been stable.

Findings in the five regions excluding Greater Bengal were: a) All-crop output grew at about the same rate as population over the half century. Output decade rates were decelerating, however, while population growth accelerated. In the first four reference decades, rates for output exceeded population, but in the last four reference decades this pattern was reversed. b) Nonfoodgrain output — especially sugarcane, cotton, tea, and groundnut — grew more rapidly than population, but foodgrain output fell behind population. c) Output expansion resulted both from increase in cultivated land and, to a somewhat lesser extent, from higher yield per acre. Acreage expansion was most rapid in Greater Punjab and showed least change in Greater Bengal. Yield per acre trends of nonfoodgrains rose rapidly, particularly for cotton, sugarcane, and tea, but the foodgrain trends were much less favorable, except for wheat.

Greater Bengal trends based on reported data differed considerably from other regions. A downward bias in rice yield per acre injected a considerable negative element into aggregate trends in that region and in British India. To remove this bias the region's rice yield per acre was assumed to be constant after the first sub-period. With this adjustment the trends for British India as a whole conformed to the pattern described above for the other five regions.

Conclusions were: a) National income per capita probably was maintained over the period as a whole, but in the

last sub-period it seems doubtful that non-agricultural output rose fast enough to compensate for agriculture's relatively slow growth. b) Change in foreign markets had considerable influence on trends for nonfoodgrain crops; output appeared more responsive to these influences than to the population's growing foodgrain needs. c) Availability of crops was not materially improved by foreign trade. Foodgrain availability per capita worsened considerably despite the change from net grain outflow to net inward flow after the first world war. d) Some technological change occurred, notably in use of improved seed, which was markedly associated with the instances of rising yield per acre trends. e) Change in labor intensity of cultivation was not clearly associated with yield per acre trends. Microfilm $4.35; Xerox $15.30. 338 pages.

ECONOMIC DEVELOPMENT IN EASTERN OKLAHOMA UNTIL 1950: THE IMPACT OF A RIGID SETTLEMENT PATTERN, MEAGER INDUSTRIALIZATION AND AGRICULTURAL ADJUSTMENT IN A LOW-INCOME RURAL AREA.

(Order No. 61-3593)

Edward John Rufus Booth, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor W. H. Nicholls

Economic development in Eastern Oklahoma until 1950 was meager compared to the advance experienced by the national economy. Starting its development quite recently from a relatively depressed level of economic welfare, Eastern Oklahoma has emerged as a rural pocket of low incomes. The object of this study was to gain an understanding of the differing conditions of economic progress within an area that shows little conformity, in its history nor in its present status, to any other underdeveloped area of the United States.

A contiguous area of twenty-four counties was delineated to obtain cross-sectional data mainly for 1910 and 1950. Data were constructed from the census to reflect the major theoretical determinants of economic development in a rural area. Hypothetical explanations of differential economic progress within the area were tested by various correlation techniques.

Disparity in levels of economic development between regions of an advancing economy were found to persist over long periods of time. Economic development in Eastern Oklahoma was mainly achieved through relative stagnation of the population rather than through growth in real income.

The persistence of disparity in farm incomes between Eastern Oklahoma and its surroundings, and even between the counties within the area, has masked an immense amount of agricultural adjustment from 1910 to 1950. Cotton and corn cropping was replaced by livestock farming, farm capital stocks increased at rates at least equal to the more prosperous western sections of the state, tenancy rates dropped from an average of three-quarters to less than one-third, farm sizes doubled and the farm labor force declined by fifty-three percent. This adjustment was not successful in solving the problem of low farm incomes. The ability to adjust appeared more crucial than the relative need for adjustment so that by 1950 the largest adjustments had been experienced by counties in the lowest ranks of farm income. By 1950 the need for further factor reallocation had not lessened in the rural area. It was estimated that fifty-eight percent of the farm workforce was still underemployed. Other factors of farm production were less severely mis-allocated although farm size and current production capital would need to be increased to meet conventional criteria of economic efficiency.

Local industrial development in Eastern Oklahoma was uneven and, except for a few centers, extremely slow. The complex of industry was not of a type expected to sustain much future growth. Manufacturing was a significant source of local incomes around the industrial-urban centers, but the location of industry had by 1950 exerted no direct impact on farm incomes. Industrialization had already demonstrated its power to improve the structure and efficiency of local farm markets. With the exception of the market for surplus farm labor, average farm incomes were apparently not much influenced by local farm market facilities.

The pattern of settlement of Eastern Oklahoma was searched for potential barriers to economic development which might have been imposed upon the area. Small farm sizes, high rates of tenancy, low levels of capital (both used and available) and inadequate schooling were found to have imposed original differences on the area which still persist and affect economic welfare on farms in 1950. Population density at settlement had no effect on industrial development but capital availability did. The pattern of industrialization was affected by education and presumably by the original lack of property rights. Original differences in industrialization have widened significantly since settlement. Microfilm $4.10; Xerox $14.40. 319 pages.

THE IMPACT OF ECONOMIC AND INSTITUTIONAL FORCES ON FARMER ADJUSTMENTS IN THE NORTH UNIT DESCHUTES PROJECT

(Order No. 61-3926)

Norman Delmar Kimball, Ph.D.
Oregon State University, 1961

Major Professor: Emery N. Castle

The North Unit Irrigation Project was authorized in 1939 and finally completed in 1949. The 50,000 project acres were originally divided into 642 ownership units averaging 77 acres. From the beginning of project operations farmers found it profitable to combine ownership units into larger operating units. By 1957 there were only 407 operating units.

Changes in prices and technology made the originally planned units too small to adequately support a family. The mechanization of agriculture allowed operators to farm larger farms efficiently. Declining farm prices made more acres necessary for farming success. Also, changes in farm organization were required for economic

efficiency. Small farmers either enlarged their farms or had to seek off-farm employment.

The objectives of this study were to appraise the present farm situation, to determine the causes of maladjustments in the farm organizations, to evaluate possible adjustments, and to analyze the obstacles to needed adjustments.

Fifty-six project farmers were interviewed in the summer of 1958 to determine current farm organization, costs, and income. Farm operations found in the area were compared with alternative programs by budgeting to determine profitable adjustments.

Actual farm organizations were also compared with the Bureau of Reclamation's estimation of mature farm development. Differences were isolated to suggest improved planning techniques.

Survey data were analyzed to isolate possible obstacles to adjustments such as personal factors, capital, credit, and availability of land. Statistical data were used to analyze the impact of the project upon the area in order to evaluate off-farm adjustment possibilities.

Irrigation project development plans for the North Unit area were made as early as 1913. The final plan was made in 1936 during extreme drought and depression conditions in the area. At this time it was assumed that a maximum number of subsistence farms should be developed. However, due to interruptions, water was not available for the whole project until 1949. Subsistence units were no longer adequate for a farm family.

Farm income increased over five times from 1944, before irrigation, to 1954, after complete development. The increased farm income stimulated other commercial activity in the community. Employment in trade and service increased 285 percent and annual retail trade increased six million dollars between 1947 and 1958. The growth of the business community provided off-farm employment to displaced farmers.

There was a wide range of net farm income among the farmers surveyed. Small farms under 90 acres averaged $1,198, medium averaged $6,059, and farms over 160 acres averaged $19,946. Small farm operators averaged over $4,000 non-project income compared to $2,000 for farmers on units of over 90 acres.

Small and large farm operators had about the same amount of long and intermediate term credit but large farm operators used 12 times as much operating credit. None of the farmers reported that they were limited by a shortage of credit.

Budget analysis indicated that farmers with less than 90 acres could profitably double their farm sizes with little increase in costs except for operating expenditures. Returns to land, labor, and capital were greater than costs with average or better management. If land was not available for expansion, feeder cattle would be a profitable addition to the farm operation.

The Bureau of Reclamation's planned farms were about one-half the size that actually occurred. Mature farms did not develop as subsistence units. Improved planning would result if a range of possible prices and technical coefficients were taken into consideration. Actual farm operation should be checked against plans to isolate differences and improve future farm planning.

Microfilm $2.75; Xerox $7.60. 162 pages.

ECONOMICS, COMMERCE – BUSINESS

PARTICIPATING ORDINARY LIFE INSURANCE SOLD BY STOCK COMPANIES

(Order No. 61-3487)

Joseph M. Belth, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Dan M. McGill

A participating life insurance policy is one in which the policyholder's actual outlay may never exceed a stated premium, but in which the outlay may be reduced, through periodic refunds, as a result of the insurer's experience. In the case of a mutual company, certain ground rules have been devised in order to minimize the possibility of manipulation of funds to the detriment of the participating policyholders. When a stock company issues participating insurance, however, the simultaneous presence of stockholders (who are entitled to the earnings of the enterprise) and participating policyholders (who are entitled to refunds to the extent that management deems them warranted) creates the need for further safeguards to assure the fairest possible allocation of the gains (or losses) of the enterprise between these two groups.

Approximately one-fourth of the ordinary life insurance in force in United States stock companies is participating. Since about one-third of the total ordinary business is in stock companies, approximately one-twelfth of all the ordinary business is in force in stock companies on a participating basis. This thesis is a study of participating life insurance sold by stock companies, with particular reference to present-day problems encountered and practices employed in attempting to handle this type of insurance efficiently and equitably.

The study is non-mathematical in nature. The first part of the treatise includes a chapter on the development of the participating concept in life insurance, a review of the characteristics of participating life insurance that led to special types of government regulation, and a discussion of that regulation. The second part of the thesis includes a discussion of the accounting implications of the sale of participating life insurance by stock companies, an appraisal of the motives that have led companies to sell this type of insurance, an analysis of data showing the relative importance of this type of insurance on the American life insurance scene, and a demonstration of the need for special regulation in this area.

The regulation of participating life insurance sold by stock companies is both non-uniform and incomplete. The non-uniformity is a normal outgrowth of state regulation of a controversial area of insurance, and the incompleteness is the result of a failure to recognize the nature of this type of insurance. The treatise includes not only a thorough discussion of the development and current status of government regulation in this area, but also contains recommendations for the improvement of the existing regulation, and thus for the general improvement of this type of life insurance.

Stock company management should not be afraid to offer participating life insurance. Indeed, in some cases there are strong reasons for them to offer it. When they

do offer it, however, they assume important additional responsibilities to the insurance buyer because of the policy provision concerning periodic refunds. It is important, therefore, for the companies to be provided with a reasonably equitable framework of regulation within which they can operate with confidence. Whether or not the states in which they operate provide for adequate regulation, however, companies should impose an adequate framework of regulation upon themselves. In the presence of this spirit of fair play, the participating life insurance sold by stock companies should garner the same degree of success enjoyed by the participating life insurance sold by mutual companies.

Microfilm $3.20; Xerox $11.25. 246 pages.

A STATISTICAL METHOD OF FORECASTING GASOLINE CONSUMPTION AT THE STATE LEVEL—AN ANALYSIS OF SELECTED WESTERN STATES

(Order No. 61-3183)

Vincent Emanuel Cangelosi, Ph.D.
University of Arkansas, 1961

Major Professor: John E. Kane

This study undertakes to develop a method of long-range forecasting of gasoline consumption at the state level, with the emphasis on an analytical statistical approach.

Illustrative forecasts of gasoline consumption are made for the United States and the individual states of Washington, Colorado, Montana, and North Dakota. The forecast year is 1970. The basic statistical techniques are direct trend analysis, analysis of trended percentages, indirect regression analysis where patterns of relationship exist, and analysis of the consumption function.

The upward trend shows that gasoline consumption (in millions of gallons) has been steadily increasing since 1946 for the nation as a whole. Although the pattern differs among each state, growth of consumption for the four selected states has been fairly constant. Because of the steady growth, trend analysis is a promising basis for preliminary forecasts.

Considering the factors which affect gasoline consumption, series of general economic and industry data are related to past consumption data. Correlation analysis indicates that there are several factors which are closely related to gasoline consumption. Among the important factors are motor-vehicle registration, average miles per gallon per vehicle, automobiles per person, vehicle-miles traveled by trucks, total miles traveled by all vehicles, population, per capita income, personal income, industrial production, and personal consumption expenditures. These variables are related to gasoline consumption in both simple and multivariate functions for each state. The functions form the bases of forecasting consumption by regression techniques. In addition to the quantifiable factors for which functional models can be constructed, there are other factors that may affect gasoline consumption. The effects of these factors must be considered even though the consideration may require subjective judgments.

For quantifiable factors that can be practically applied to a forecasting program, simple regression analysis provides the bases for individual forecasts. The combined effects of all quantifiable factors on gasoline consumption can be related in a single functional relationship by deriving a multiple-regression equation in each case. If all such factors independently contribute to the quantity of gasoline consumed, estimates based on multi-factor forecasts yield more accurate results. For a single state, there are material differences between the various estimates based on the individual factors in simple-regression forecasts as well as the estimate based on multiple-regression analysis. These differences are randomly distributed.

An aggregate consumption function between gasoline consumption (the dependent variable) and personal income (the independent variable) is considered as a possible forecasting tool. In this function individual states are considered the consuming units. Analysis of the function reveals that a stable consumption function does exist in the case of gasoline. This stable function provides another possible means of forecasting the future consumption of gasoline.

On the basis of the over-all study, a proposed program for the long-range forecasting of gasoline consumption is presented. The problem incorporates the various statistical techniques into a forecasting method and offers it as a possible solution to the forecasting problem in the gasoline industry. Microfilm $3.90; Xerox $13.75. 302 pages.

HUMAN CHARACTERISTICS AS THEY LIMIT INFORMATION SYSTEMS

(Order No. 61-3514)

Leonard Joseph Garrett, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Robert P. Brecht

STATEMENT OF THE PROBLEM

It was the aim of this work to provide a means for conducting research in business information systems and to make an inroad into the identification and relationship of the human characteristics which limit business information systems.

Precisely the work:

1. Tests the use of operational simulation as a tool for business research. "Operational simulation" is used in the work for what is variously termed operational gaming, war games, business games, management gaming, etc.
2. Isolates, identifies and relates the human-limiting factors connected with business information systems.

PROCEDURE AND METHODS

To accomplish these aims the work is divided into five sections.

1. The first area presents a brief recapitulation of the technique of operational simulation. It is included to provide a framework within which the specific operational

simulation model employed in the study can be considered.

2. The second section is devoted to a presentation of the generalized operational simulation model utilized in the research. This model describes the function of resource allocation in a research organization.

3. In the third section a specific business research environment, systems and procedures, is fitted on the generalized resource allocation model and the mechanics of the simulation are put forth.

4. Section four isolates and relates the human-limiting factors which are identified by the simulation.

5. The final section presents the conclusions and speculations which can be drawn from the study. In it the validity and future of operational simulation as a research tool are considered, and the implications of the human-limiting factors are presented.

RESULTS

Although it cannot be conclusively proved sufficient evidence suggests that the simulation approach induced the participants to react in a manner based on the habit patterns followed in business. The differences in the results obtained from the businessmen, graduate students, and undergraduate students who participated in the simulations, casts doubt that tests of business behavior can be attempted with groups which do not have habit patterns similar to those held by businessmen.

Finally, that the operational gaming technique allows the isolation of the behavioral factors influencing the acceptance of information. Five human-limiting factors were isolated. They were Tangibility Limitations, Personnel Measurement Limitations, Enterprise Limitations, Technical Limitations, and Organizational Limitations. In addition, their effect on a business information system was analyzed.

CONCLUSIONS

The conclusions which can be drawn fall into two areas. First, from the evidence in the dissertation it appears operational simulation can be used as a research tool. This is not to imply that the approach has been totally validated or that there are still not limitations to the approach. Rather, that the results of this initial use of the technique are encouraging and seem to indicate a wide horizon for the approach in the future. What is more, it is only by developing such new tools or methods of research that progress can occur. Therefore, the development of such new techniques must be a cornerstone in business research.

Second, taken individually and as a group, the human-limiting factors bring to light numerous considerations about the acceptance of information for decision-making.

Microfilm $3.20; Xerox $11.25. 247 pages.

PROFESSIONAL DEVELOPMENT AT THE MANAGER AND PARTNER LEVELS IN NATIONAL FIRMS OF CERTIFIED PUBLIC ACCOUNTANTS

(Order No. 61-5096)

Dee Lee Kleespie, Ph.D.
The Ohio State University, 1961

In recent years continuing education has been the object of much attention in the various professions, including those of law, medicine, and public accounting. Professional accounting organizations in the past several years have expended considerable effort in this direction, although almost all of the results were aimed at small firms and individuals in the lower staff levels. The apparent lack of information at the advanced staff and partner levels regarding educational and development activities prompted this study. The approach utilized was that of visiting a group of leading national firms of certified public accountants. Interviews were held and a study was made of appropriate materials in their files in order to obtain a more thorough understanding of professional development at these levels. It was considered that as the individual progresses in a firm, his duties and responsibilities change, and accordingly the training needs may also change. The pattern appears to be one of emphasis on the attainment of technical competency in the earlier years, gradually changing to the acquisition of ability in job administration, and finally the assumption of broad responsibilities as a partner.

The study is divided into two separate phases. In the first of these attention is directed to the question of organization and administration of the program. Items discussed include those of the degree of acceptance of the need, the individual responsible for the program, the form of the program, and coordination within the firm. This section also contained an examination of the pertinent factors of personnel planning, the appraisal process, and sources and selection of personnel. Suggestions for strengthening this area include changes in firm policies and procedures and the questioning of the appraisal process and the uses of the information resulting therefrom. In the second phase the actual training processes are considered. The present programs depend primarily upon on-the-job training, with progressively fewer formal courses and meetings for the higher levels of staff. Some assistance is also provided in the form of reference materials and consultation with specialists in the same or other areas. In general the firms did not rely to any appreciable extent on training efforts presented outside of the firm, although participation in professional and community affairs was stressed. Recommendations made include those of increased use of group study efforts, additional control and improvement of the local office training meetings, and attempts to provide more and better opportunities for the manager and partner to learn through experience situations.

Microfilm $2.75; Xerox $7.60. 161 pages.

A STUDY OF CURRENT ACCOUNTING SYSTEMS AND PRACTICES IN APPAREL STORES IN ARKANSAS

(Order No. 61-3189)

Luther Paden Neeley, Ph.D.
University of Arkansas, 1961

Major Professor: Nolan E. Williams

The primary objective of this study was to make a detailed survey of independent apparel stores in Arkansas to determine the adequacy of accounting procedures used in the following areas: accounting systems, accounting practices, financial statement analysis, and budgetary planning and control. Further, it was the purpose of this study to suggest alternative procedures which might possibly produce more satisfactory results in these areas.

A sample of 100 apparel stores was selected from fifteen cities throughout the state of Arkansas. Information concerning the accounting procedures and analytical techniques used was obtained from questionnaires answered by the owners or managers of these stores in personal interviews.

Full presentation of the results of the study is found in 23 tables. In addition to the results for the entire sample, the answers to the questionnaires are presented by type of store (men's apparel, women's apparel, children's shops, shoe stores, and department stores) and by store size (annual sales volume) in 46 supplementary tables in the Appendix.

The major deficiencies by areas were:

(1) Accounting systems. Too many owners attempted to design their own bookkeeping system, usually on a trial and error basis. The use of the single entry system was far too common. A serious lack of adequate supplementary records was also found.

(2) Accounting practices. A large number of stores did not have an audit performed by an independent auditor. The procedures used in extending credit and handling accounts receivable were not adequate. Inventory controls were also inadequate.

(3) Analytical techniques. Too few retailers prepared their statements more often than once a year. The use of financial ratios for analysis was inadequate. Of the ratios prepared, the retailers definitely favored those directly relating to the profit of the business. Comparative analyses for purposes of establishing or determining trends were deficient.

(4) Budgetary planning. Many of these small retailers seemed to feel that since they are able to maintain close control over the operations of their businesses, an operating budget was unnecessary. None of the budgeting or planning procedures found were adequate; particularly weak were the planning and control of accounts receivable, inventories, and expenses.

Many of these small merchants apparently fail to recognize that adequate financial records, if properly used, can be an important factor in business progress.

From the results of the study made, the following recommendations were presented.

The aid of an independent accountant in establishing an accounting system appears necessary; the use of prepared commercial systems, especially those tailored for the specific type of business, is also a desirable means of establishing an adequate system of accounts. An independent audit should be made once a year, preferably by a professional accountant. In addition to presenting the owners with an accurate picture of the financial history and present position of the business, the accountant normally will be able to discover weaknesses or deficiencies in the procedures used and suggest desirable alternatives. Most of the owners apparently realized the value of competent assistance in preparing government reports. Frequent preparation of financial statements is recommended because it aids in earlier discovery and elimination of inefficiencies and allows a comparison of results on a seasonal basis. Financial ratios are useful in presenting significant relationships between figures, particularly when compared with some form of standard developed internally or externally. The use of horizontal statement analysis is excellent in revealing trends and predicting future operations. Although a formal financial budget is not always necessary in the small retail store, every retailer can utilize effective planning in the areas of sales, accounts receivable, inventories, and expenses.

Microfilm $3.65; Xerox $12.85. 284 pages.

DIFFERENCES AND SIMILARITIES AMONG SMALL BUSINESSMEN – A SURVEY OF FOUR POPULATIONS

(Order No. 61-3274)

James Ray Omps, Ph.D.
University of Pittsburgh, 1961

This dissertation describes an attempt to discover whether patterns of similar characteristic responses existed among members of four populations of small entrepreneurs questioned in late 1959 and early 1960. Populations included only persons who were either owner-operators or top decision-makers (managers) of businesses defined officially by the Federal Government as "small."

Businessmen of each population were compared with those of each of the other populations and then, for accent or contrast, with 1,700 top executives of major corporations polled by Fortune in 1959. While dispersed geographically, all four populations were and are familiar to the author. Validity of certain responses also was checked against objective information available from official or organization records.

All members of each population were asked to answer a questionnaire. From 60 to 90 per cent of each population did so. A response was omitted from the final tabulation only when one or more "key questions" were ignored. Population A included 227 of the 419 members of the Smaller Manufacturers Association of Pittsburgh. Population B included 247 miscellaneous small businessmen of the Pittsburgh metropolitan area chosen substantially at random. Population C consisted of 240 rural West Virginia businessmen. Population D was comprised of 102 businessmen who function in or near a rural Utah county.

Size and type of business, its history, age and marital

status of the businessmen, their education, and other background material was determined by "factual" questions. Other groups of questions elicited responses that were essentially either self-appraisals or mere opinions. All questions, however, were phrased and sequenced to minimize suggestion and to permit both direct and oblique approaches to controversial or possibly embarrassing subjects. All 89 questions (some in several parts) were chosen because of points raised in the literature or in the experience of the author as an active small businessman. Answers to ten "key" questions by the four populations were averaged and compared with the data from the 1950 Census, two 1955 studies of big businessmen, and the Fortune poll as a measure of additional control. Answers to all questions are tabulated in an appendix.

The author concludes that small businessmen appear to be differentiated from other elements of American society only by their economic methods and motivations; otherwise, they respond to the same personal pressures which motivate other men. He finds no significant differences either between large and small businessmen or among the latter. In almost all cases what appear to be differences can be accounted for by environmental factors, or by religion, or relative mobility, or education, or very real differences between disparate types of business.

Significant in the study, according to the dissertation, were the similarities in the answers of all four populations. Most significant of these, the author believes, was that the small businessmen become top decision-makers at relatively early ages, much earlier than did the corporation executives in the Fortune poll, who in so many other ways resembled the older and richer small businessmen. Having started earlier, small businessmen remain at the top three times as long as executives of large corporations. Whatever individualism they had in the beginning was intensified; they escaped many of the pressures toward conformity exerted upon the executives of a firmly-structured microcosm such as the Army or a large corporation. Such early and extended "isolation at the summit" has been credited in the past with making ship captains independent and, sometimes, eccentric. The dissertation suggests that it equally affects manufacturers, or retailers, or garage-owners, or stock-farmers.

All material in the dissertation is primary, derived from the study, except for literature quoted or paraphrased in one chapter and the polls or older studies used as controls. Microfilm $2.75; Xerox $6.80. 145 pages.

THE EFFECTS OF PRICE LEVEL CHANGES ON THE FINANCIAL STATEMENTS AND PERFORMANCE RESULTS OF MUTUAL FUNDS

(Order No. 61-5115)

Donald Froh Pabst, Ph.D.
The Ohio State University, 1961

The accounting and financial reporting problem analyzed in this study was created by the marked degree of inflation in the United States during the past two decades. During this period, one of the basic accounting assumptions has been challenged -- the assumption of a reasonably stable monetary unit. Members of the profession have questioned the usefulness of financial statements prepared under this assumption when, in fact, the monetary unit has not been stable.

The financial statements of mutual funds are unique in that the assets are stated at market value. Some writers have implied that if the assets of industrial firms were carried at market value, there would be no price level problem. The point is made in the study that the problem of adjusting data for changing prices is actually twofold. Both the "price structure" and "price level" problems are applicable in industrial firms. The mutual fund industry was selected because only the price level problem exists in the industry.

The purposes of the study include a determination of the effect of price level changes on the financial statements and performance results of mutual funds, stated in quantitative terms. A related purpose was to develop a new performance method to eliminate the effect of price level changes. Twenty mutual funds were selected to compare the performance results, as determined by the new performance method, with the results obtained from a traditional performance method for the ten-year period ending December 31, 1959. The final purpose was to present the theoretical implications of the study as additional insight into the twofold problem of changing prices.

A method was proposed for the computation of "real capital gains" for securities sold by individuals and mutual funds. The method is based on a definition of "capital" in terms of purchasing power. The disposition of the real capital gain distributed to a mutual fund shareholder should depend upon his investment and reinvestment policies. This method provides a realistic recognition of the fact that the historical acquisition cost of securities is not an equitable basis on which to determine capital gains in periods of marked inflation or deflation.

The Consumer Price Index was selected to make the adjustments. The effects of price level changes on the financial statements of a particular fund were determined, and the new performance method was used to compute the annual and ten-year performances of the twenty funds. A recommended statement of changes in net assets and a statement of per share income and capital changes prepared in "common-dollars" were presented. Other suggestions were included for the presentation of mutual fund financial data in "common-dollars."

It was concluded that the ten-year performance results of the twenty funds were significantly overstated -- on the average 34.2 per cent. The results for 1950, 1951, 1956, and 1957 were also significantly overstated. The study indicated that the overstatement becomes larger as the price level increase becomes more excessive and the increase (or decrease) in the stock market index becomes smaller. On the basis of the study, it was recommended that published performance methods should be revised to take into consideration the effects of changing price levels. The recommendation was made that the financial statements, per share statistics, historical data, and performance results of mutual funds should be published or computed on the basis of "common-dollars," eliminating the effects of the changing price level.

Microfilm $2.75; Xerox $9.45. 210 pages.

COMPETITIVE STRATEGY DIRECTED TOWARD SALES PROMOTION AMONG INDEPENDENT RETAIL SPECIALTY STORES DEALING IN MEN'S WEAR IN ARKANSAS

(Order No. 61-3190)

Guy Theron Peden, Jr., Ph.D.
University of Arkansas, 1961

Major Professor: H. A. Frey

This study attempts to determine the extent to which certain independent men's wear retail specialty stores in Arkansas make rational decisions with respect to sales promotion expenditures. The criterion used to judge rationality is success in business as measured by sales volume achieved and profits earned. While success may not be conclusive proof of rationality, it is the only available criterion since one has no way of knowing effects of random variables such as "luck," or unpredictable hazards. The closeness of the relationship between money spent for sales promotion and the volume of sales is the determinant of the extent of rationality. Where the relationship is close, it is determined that the businessmen are rational in their decisions. Where the relationship is not close, decisions--if based on any information--are based on information that is less reliable. Thus, the decisions will be less rational.

A model was set up to determine profitableness, and case studies were made. Information concerning sales promotion and sales volume was used to determine whether the businessmen moved during the period under consideration from a less profitable position to a more profitable position.

The businessmen were divided into groups based upon the nature of the sales volume increase. The Group I firms had the largest sales volume increase over the period; the Group II firms had the smallest sales volume increase. Information from the case studies and writings of those in the field are analyzed in terms of a framework of competitive strategy, translated from principles of military strategy. It is determined with one exception that the same framework which is applied to military operations may also be applied to competitive operations. The exception concerns the proposition that surprise can be attained by deception. State and Federal enactments serve as deterrents to this practice.

It appears evident that principles of competitive strategy may implement businessmen's decision-making patterns generally enabling them to achieve a larger, more profitable volume of sales. These, however, will not guarantee maximum profits. As a given military principle may produce varying results in successive battles, so may particular principles of competitive strategy produce varying results in successive business operations. This, however, does not destroy effective use of the principles as rational devices to assist in decision making.

For all firms and the Group I firms, increases in sales volume are larger than the increases in total costs of major sales promotion expenditures. The profit model demonstrates an increase in profits for these. It appears that larger expenditures for sales promotion, larger sales volume, and larger profits describe the situation with respect to these firms. This would indicate that decisions concerning types, places, and times of sales promotion expenditures would be based on substantially accurate information of alternatives. This indicates that these expenditures for all firms as a group and for the Group I firms are rational.

For practical purposes with respect to the Group II firms, it may be said that, with no increase in sales promotion expenditures, a slight increase in sales volume and an increase in profits occurred. The relationship between sales promotion expenditures and sales volume is such that the small increase in sales volume and the increase in profits appeared because of something other than expenditures for sales promotion. On this basis, it appears that the sales promotion decisions of this group were less rational. It is outside the scope of this study to determine the probable cause of this.

Microfilm $3.70; Xerox $13.05. 288 pages.

LUMBER MANUFACTURING ON TWO CONTINENTS: WITH SPECIAL REFERENCE TO THE ORGANIZATION AND CONTROL OF LUMBER MANUFACTURING FIRMS, SCIENTIFIC PRODUCTION MANAGEMENT, AND INDUSTRIAL ENGINEERING TECHNIQUES.

(Order No. 61-3682)

Alexander Leka Srbich, Ph.D.
University of Minnesota, 1961

Adviser: Albert Wickesberg

The purpose of this pilot study was to (1) seek information on management practices employed in the lumber manufacturing industry in the United States and three European countries, (2) search for differences and similarities in management practices, (a) within each country, (b) between European countries, and (c) between European countries and the United States, (3) analyze the differences and similarities in terms of certain background information concerning each country. It is hoped that (1) certain management practices apparently useful under a variety of conditions would appear, and (2) variations in management practice would appear under recognizably different conditions. In this way a first step would be taken to improve management practice in this industry.

The basic hypothesis this study was designed to test was: There are differences between American and European lumber manufacturing firms in management practices employed in executing the major managerial functions of planning, organizing and controlling.

The study was conducted among three leading lumber manufacturing firms in California and in three each of such firms in France, Germany, and Sweden, and the national lumber manufacturing association in each country visited.

Each company was interviewed at length, and answered detailed questionnaires. In addition, numerous conferences were held with representatives of the national lumber manufacturers associations in each country visited.

Although each company and trade association were interviewed at length, it was found impossible to secure sufficient data on operating results to employ a criterion of the effectiveness of management practice. Thus the only criterion available was workability and the findings involve

the various management practices found useful but do not specify the practices which work best.

Summary of Major Findings

1. Management practices differ considerably among the American and the European lumber manufacturing companies studied.

2. Management structure is less complex and more centralized in European than in the American lumber manufacturing companies.

3. American management practice differs from European management practice in size of the board of directors, composition of the board of directors, delegation of authority and responsibility, use of staff departments, relative size of the research and development department, uniqueness of control system, use of management committees, use of trade associations, use of management consultants, and method of training managers.

4. The number of staff departments found appears to correlate positively with size of firm. The smallest number of staff departments was found in France, the largest in the United States. The ranking follows the philosophy of delegation as well as size of firm.

5. Use of organization charts appears to correlate positively with size of firm. The smaller size of French and German firms together with low employee turnover were cited as reasons for believing organization charts unnecessary.

6. The European firms studied make much less use of committees, of management consultants and of formal management training programs but much more use of the National Lumber Manufacturing Association than do the United States firms.

7. Decision-making in all the companies studied relied on judgment and experience and did not include the use of operations research or linear programming.

8. Production management and industrial engineering techniques were found in use less often and less extensively in France and Germany than in Sweden and the United States.

9. Major differences center around delegation of management's functions and activities and management specialization.

10. Much of this difference can be accounted for by difference in company size.

Other variables which seem to explain differences in management practice are (1) lumber supply, (2) lumber market, (3) laws, (4) ownership, (5) national temperament, customs, and tradition. While it is difficult to attach weights to these factors, the last is not the least significant.

Microfilm $3.45; Xerox $12.15. 268 pages.

ECONOMICS, FINANCE

ASPECTS OF FEDERAL RESERVE POLICY, 1951-1959: FACTS AND CONTROVERSIES.

(Order No. 61-3867)

Daniel Stephen Ahearn, Ph.D.
Columbia University, 1961

Some critics of monetary policy recently have gone so far as to argue that monetary policy is inherently defective and needs to be replaced by more reliance on direct control of various types of economic activity. This would mean a considerable increase in Government control of the economy and, accordingly, is not a step to be taken lightly.

This study examines the possibility that some of the alleged deficiences of monetary policy stem from the way in which monetary policy has been conceived and applied by the Federal Reserve, rather than from any inherent defect. Accordingly, the study examines the 1951-59 record of Federal Reserves monetary management -- in terms of the choice of monetary instruments used and the general conception of the proper scope of monetary management -- against the background of the controversies about Federal Reserve policy. The main focus is on whether the Reserve System's approach was well designed to influence appropriately monetary magnitudes and the financial markets, for it is these which affect "real" economic decisions of the economy at large.

The first part of the study sets out the general background in which the 1951-59 policies of the Federal Reserve were formulated and compares Robert V. Roosa's view -- sometimes called the New York Reserve Bank view -- of how monetary policy should be conducted with the apparent views which actually governed Federal Reserve monetary policy from 1951 to 1959.

The second part of the study makes a comprehensive yet detailed survey of the Federal Reserve's use of monetary policy instruments during the 1951-59 period. Most attention is given to the policy of confining open market operations to "bills only" because this has aroused the most controversy and also because open market operations are widely considered to be the most important monetary policy instrument. There is also extended discussion of discount policy, changes in reserve requirements, and selective controls on consumer and real estate mortgages credit. The following conclusions are drawn:

(1) Continuous adherence to the "bills only" policy was and is undesirable.

(2) The discount mechanism should be used primarily as a "defensive" weapon of monetary policy. To avoid unwanted "announcement effects" when discount rate has to be changed to keep it in line with market yields, it might be worth trying an arrangement under which the discount rate ordinarily would be set automatically at a stipulated margin above or below the weekly 91-day Treasury bill rate, with the margin subject to change by the Federal Reserve authorities whenever this seemed necessary.

(3) Moderate, well-timed increases in reserve requirements might be used as part of the Federal Reserve's program of credit restraint in order to achieve a quicker

and more pervasive impact on bank reserve positions and the money supply.

(4) Selective controls on consumer and mortgage credit might well prove useful supplements to general credit restraint at times when such types of credit are expanding too rapidly but should not be continuously restrictive since constant interference with consumer preferences and the market's allocation of resources is undesirable.

The third part of the study discusses the over-all impact of the Federal Reserve's application of policy instruments on monetary magnitudes and financial valuables in the 1951-59 period. An analysis of the behavior of the money supply suggests that Federal Reserve influence over this important quantity has been imperfect but not so much so as to justify abandoning discretionary monetary policy, as some critics have suggested, particularly since use of modest reserve requirement increases to restrict credit might improve control of the money supply. However, it is suggested that the Federal Reserve, in conducting monetary policy, give weight to the importance of interest rates, liquidity and velocity as well as to the money supply.

An analysis of changes in income velocity since World War II suggests that the importance of velocity increases as an offset to credit restraint will be considerably less in the future than in the past postwar years. An empirical test (using Treasury survey data on the ownership of Treasury bonds) of Robert V. Roosa's thesis that rising yields and falling prices on long-term U. S. Government bonds make financial institutions more willing to hold them, and therefore less willing to extend credit to private borrowers, indicates that this is true for life insurance companies and mutual savings banks but not for other financial institutions. The conclusion is drawn that the Federal Reserve's influence on life insurance companies and savings banks could be increased if it directly affected yields and prices of long-term bonds.

The general conclusion is that central bankers require a full complement of instruments, a flexible approach to their problems, and a willingness to regard techniques and instruments of policy as tentative and subject to modification as the environment changes if they are to be most effective. Failure to accept this view impaired the effectiveness of monetary policy from 1951-59. A willingness to adopt it might increase the effectiveness of monetary control in the future.

Microfilm $7.40; Xerox $26.35. 584 pages.

FEDERAL RESERVE POLICY IN THE TWO POST-ACCORD RECESSIONS, 1953-54, 1957-58.

(Order No. Mic 61-786)

Abdelhak Belkora, Ph.D.
University of Colorado, 1960

Supervisor: Associate Professor James Dugan

The purpose of this thesis is to examine the mechanics of Federal Reserve policy actions in the two post-accord recessions of 1953-54 and 1957-58, and to evaluate whatever contributions these policy actions made to the revival of business activity.

The Federal Reserve followed a policy of "active ease" in the recession of 1953-54 and a policy of "positive ease" in that of 1957-58. Through an integrated program of open market operations and reductions in reserve requirements free reserves (defined as excess reserves less borrowing at Reserve banks) averaged over $500 million from the peak of July 1953 to the trough of August 1954. From the peak of July 1957 to the trough of April 1958 free reserves reached smaller proportions than in the preceding decline but averaged over $400 million for the first half of 1958.

Adhering to its March 1953 decisions, the Federal Reserve confined its open market operations in both recessions to the purchase of Treasury bills. In fact, purchases of other than short-term securities would have been unnecessary. As reserve positions of banks strengthened and demand for loans dwindled banks turned to purchases of intermediate and long-term securities to sustain earnings. Thus, mostly through banks' action the entire structure of interest rates moved downward.

The present methodology of empirical research affords no precise way of separating the effects of monetary policy from the effects of other policies. There are good indications, however, that the Federal Reserve did have a strong stabilizing influence on business conditions in the two post-accord recessions.

On the positive side residential construction and State and local expenditures showed a marked sensitivity to interest rate declines. From the 1953 second quarter peak to the 1954 second quarter trough gross national product decreased at an annual rate of $9.9 billion. During that time the increase in construction and State and local expenditures, however, was at an annual rate of $4.1 billion or more than 40 percent of the decline in gross national product. Again from the 1957 third quarter peak to the 1958 first quarter trough gross national product fell at an annual rate of $18.5 billion. Residential construction and State and local expenditures for the same period accounted for an increase of $2.2 billion, annual rate, or about 12 percent of the decline in gross national product.

On the negative side the problem is a moot one. Many business investments were ostensibly insensitive to interest rate declines in both recessions since the movement of interest rates and that of expenditures on producers' durable goods and inventories was in the same rather than opposite directions. However, this experience cannot prove conclusively that business borrowing was entirely interest inelastic. It is conceivable that the drop in investment was due to the inward shift of the investment demand curve and not to the movement on that curve.

While it is literally impossible to tell by how much investment was affected by interest rate declines, observation of some meaningful phenomena indicate that businesses were not completely insensitive to money market conditions in the two post-accord recessions. For one thing, in both recessions when monetary ease was in full swing the rate of decline of capital and inventory spending slowed down. For another, during the two periods of decline corporate security issues, mostly bonds, remained at high levels. In the year ending June 1954 corporate security issues declined by only $1 billion to $6.7 billion, and in the year closing June 1958 security issues fell by a mere $.2 billion to $12.3 billion.

Microfilm $2.90; Xerox $10.15. 224 pages.

THE INDEPENDENCE OF THE FEDERAL RESERVE SYSTEM

(Order No. 61-3494)

Albert Jerome Clifford, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. C. R. Whittlesey

The problem of independence was widely recognized at the time of the establishment of the Federal Reserve System, and safeguards were built into the new organization. The issue manifested itself in six different ways involving the relations of: Reserve Banks to each other, Reserve Banks to the Board, Reserve Banks to owner banks, the System to the Treasury, the System to the Administration, and the System to Congress. These relations varied in importance throughout the history of the Federal Reserve.

The safeguards were structural devices for governing principally those relations which concerned the authority of the separate Reserve Banks and of Banks and Board. A main purpose of these safeguards was to prevent domination by either Government or owner banks. The devices used, however, complicated the authority lines within the System and hindered unity in policy formation and operation. Moreover, they were not entirely successful in solving the alleged problems of Treasury domination at critical times or in assuring that the interests of owner banks did not, at other times, exert too great an influence.

The structural safeguards for independence also fostered separation of the System from formation and execution of economic policy by the Administration. For its own effectiveness the monetary authority had to cooperate actively both in the Government's wartime finance policies and in policies directed toward the peacetime welfare of the nation.

Meanwhile, the System's relations with Congress grew in importance. The early concern of Congress for the appropriateness of decisions and operations of the Federal Reserve increased with the broadening content and objectives of legislation. Demands for explanations became more detailed, led on to proposals for radical changes, and made the development of independence for the System more complicated. Since Congress desired to keep the ultimate control, it supported the independence of the Federal Reserve in relations with the Treasury and the Administration. But it also attempted to make the System more accountable to Congress. How to achieve a working relationship between the sovereignty of the lawmaker and the accountability of an effective monetary authority acting as an agent and trustee became the dominant issue.

In the evolving economic and political environment, relations between Reserve Banks and Board were of perduring importance. As the System acquired greater responsibilities, the internal struggle shifted from the promotion of autonomy for the Banks to the achievement of unity for the System. This was a matter of self-preservation. Hindrances to unified responsibility obstructed the necessary development of the System as a responsible agent and trustee, accepted by Congress and the Administration.

In the present status of the issue, neither Government nor Federal Reserve officials consider that independence in any of its expressions is unchanging or unchangeable. To make the independence of the Federal Reserve within the Government more effective and desirable certain provisions need to be fulfilled. First, the System must be ready at all times to explain itself: its organization, actions, and purposes. This involves a clear recognition of the complexities of banking and constitutional processes and requires willingness on the part of both Government and Federal Reserve to have the complexities simplified. Secondly, the System must work for its being accepted by the Government--Executive and Congress--as competent and as, potentially at least, well-ordered, both internally and externally. Such acceptance demands, among other things, a working cooperation with Government organizations having similar or related powers and goals. The general conclusion is that the independence of the Federal Reserve will be as effective and as desirable as the System is adequate with its explanations, cooperative in action, and accepted as to status.

Microfilm $4.75; Xerox $16.90. 371 pages.

AN ANALYSIS OF THE DISTRIBUTION OF THE MINNESOTA PERSONAL PROPERTY TAX

(Order No. 61-3668)

Thomas Frank Hady, Ph.D.
University of Minnesota, 1961

The purpose of this study was to determine the distribution of personal property tax payments by income size groups in Minnesota in 1958, and to make some comparisons with alternative forms of taxation.

The economic structure of various sectors of the Minnesota economy--retailing, manufacturing, farming, etc.--was first analyzed to determine, in each case, the probable incidence of the personal property taxes levied on each sector. In cases in which there was some doubt as to the incidence of the tax, alternative assumptions were employed. The amounts of tax levied on each sector were estimated, using detailed data available from Minnesota assessment records. Tax payments were then distributed among income groups according to the types of receipts or expenditures on which the tax fell and their estimated distribution among income groups. Data on the distribution of receipts and expenditures among income groups were obtained from a number of different sources.

Three estimates were made of the distribution of tax payments: A "Most Regressive" estimate, a "Most Progressive" estimate, and a "Most Likely" estimate. Each estimate was based on a somewhat different set of assumptions about the incidence of the personal property tax. There was relatively little difference among the three estimates, in spite of the varying assumptions. All three estimates indicated that the personal property tax is regressive. In the "Most Likely" distribution, estimated tax burdens ranged from 1.6% of income in the under $2,000 class to 0.5% in the $7,000-$10,000 class. The tax as a percent of income in all three cases fell rapidly as income increased to about $4,000, then leveled off. There was, however, also some indication that at levels above $7,500-$10,000 the tax becomes progressive because of the steadily increasing importance of dividends in incomes.

While over-all quantitative estimates could not be made because of the non-availability of data, the evidence

strongly suggests that personal property tax payments are highly variable within income classes. Quantitative estimates of the variation were made for taxes on agriculture and for taxes on household goods. In both cases there was a large amount of variation. In addition, there is substantial indirect evidence to indicate the existence of wide deviation in burdens. There appear to be four major reasons for this variation: (1) lack of uniformity of tax rates, (2) lack of uniformity in assessments, (3) differences in capital requirements of businesses and in consumption patterns of consumers, and (4) differing sources of income.

Comparisons were made, also, with sales and income taxes. In general the sales tax appears to be at least no less regressive than the personal property tax, and in many of its forms, less so. This conclusion must be qualified, however, with the fact that the personal property tax appears to become progressive in the higher income ranges, whereas the sales tax, in its common forms, does not. The present Minnesota income tax shows a progressive rate structure up to a level of about $20,000 and then becomes regressive. This is, of course, the opposite of the tendency shown by the personal property tax.

Microfilm $2.75; Xerox $4.00. 73 pages.

THE EFFECT OF MERGERS ON PRIVATE PENSIONS

(Order No. 61-3519)

James Dillard Hammond, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Dan M. McGill

Pensions in general have been the subject of much analysis. Only in recent years, however, have reviews been made of some of the more specialized areas of pensions. One aspect, commonly ignored but yet complex, is that which concerns pension modifications brought about by the combination of firms with existing pension plans.

Although workers may continue in the employ of a merged firm, they may find that the promise of a retirement benefit will undergo many changes. The security which an employee expects of a pension can obviously be affected by the merger of the firm with which a particular employee is employed. Such alterations are, for the most part, beyond the employee's control. Moreover, the firm itself has no immunity from the possible effects of such pension changes. The problems inevitably center on the reconciliation of the apparent conflict between pension costs and pension security.

In order to provide a proper framework for analysis of pension-merger problems, it is necessary to address the main problems somewhat gradually with emphasis upon tax and termination material. Following this, the dissertation centers upon the actual techniques of integrating different benefit formulae to provide uniform and equitable benefits to all employees. Cost ramifications of different funding media and methods are also explored, as well as the possible techniques of integrating different funding arrangements.

A great deal of the material for analysis is from original sources. Plan contracts and documents provided information regarding specific plan provisions. Much information came from conversation with pension consultants and actuaries. A questionnaire, sent to 162 firms which had merged and had pension plans both before and after the merger, also provided useful data.

In an area where there is such a variety of circumstances as well as a variety of solutions, it is not possible to formulate a problem-solving panacea. In many instances the firm itself is not aware of the questions involved. Here, competent counsel and advice are imperative. Somewhat unlike the effect of other economic changes, a merger presents an opportune time to review the plans of the combining firms. A thorough review may highlight many details which would otherwise have gone unnoticed and thereby enable plan changes to be effected with minimum delay.

The successor firm usually does not provide full credit for the past service of acquired employees. This practice, although perfectly legal, is illogical. Pension liabilities of an acquired firm should be viewed as an acquired obligation and considered in the purchase price of the predecessor firm. This antithesis between practice and logic usually results in a compromise between security and cost. With the present legal environment, purchased benefits of acquired employees should be secure and, if proper agreement can be achieved between the firms, accrued or unpurchased benefits should remain intact, to be provided by the successor firm.

It is possible that a merger may precipitate termination of one of the plans. In view of this possibility, termination provisions may become the focal point of discussion. Not all such provisions are clear as to their intent and distributions to employees may be indefinite. Not only does any lack of clarity undermine remaining employee security, but it may also delay plan integration. No one is so idealistic as to foresee a time when plans will not terminate. Termination clauses then, should be precise, definite, and equitable to employees.

Mergers will continue to occur. Thus, it becomes imperative to undertake a proper and thorough analysis of any resulting plan changes. The outcome must achieve an equitable compromise between security and cost. This study is meant to provide a proper framework for such analysis. Microfilm $2.75; Xerox $9.25. 203 pages.

FINANCING THE POSTWAR EXPANSION OF BUSINESS: AN INDUSTRY ANALYSIS.

(Order No. 61-3719)

Herman I. Liebling, Ph.D.
The American University, 1961

Chairman: Professor Simon Naidel

This study consists of an analysis of the post-World War II characteristics and dimensions of investments and their means of financing among the major component industries of the nonfinancial corporate sector of the United States economy. Using the Department of Commerce sources and uses of funds statement for the aggregate nonfinancial corporate universe as a framework for the data, the study disaggregates these data and analyzes

developments during the postwar years in the following corporate sectors: manufacturing and mining, railroads, nonrail transportation, public utilities, communications and trade. These industries account for about nine-tenths of the assets of the nonfinancial corporate economy.

The study contains three approaches to the industry analysis of corporate sources and uses of funds:

1. Analysis of the structural differences prevailing among industries in a recent year with respect to: types of investment of funds and sources of funds, relative dependence on internal and external sources, debt and equity shares, etc.
2. Analysis of the changing patterns of finance, stressing shifts in the structure in the more recent period compared with that prevailing in the earlier postwar years. Limited reference is made to changes in the industry structure of finance over the longer term, as revealed by data recently made available by the work of the NBER.
3. Analysis of the differential industry cyclical response of corporations with regard to fluctuations of investment and financing.

The study presents detailed annual figures of sources and uses of corporate funds in the aforementioned six industry groups, 1947-58, which provide the magnitudes used for the analysis directed toward the three aforementioned objectives. Industry characteristics of output, as well as corporate size, are shown to be an important influence in determining both the types of corporate investment and the particular sources of financing used. The influence of type of inventory in durable and nondurable goods industries on effectiveness of monetary controls is explored.

A U-shaped distribution in the proportion of fixed to total assets emerges upon breakdown of the structure of investments in manufacturing and in trade when IRS data are classified by asset size. The data indicate that economies of scale with respect to fixed assets may be of greater magnitude than in other types of investment.

The study points to heavy reliance of most industries on internal sources of retained earnings and depreciation to finance investments in the postwar period. Funds provided by depreciation and amortization in aggregate nonfinancial business became twice as important as retained earnings--a reversal of position from the early postwar years.

Associated with these findings, however, was the continued dependence on external sources of funds in nearly all of the industries during years of strong capital demand. Based on a "selected points" analysis of the three postwar upswing periods, these data suggest the long-term uptrend in the share of internal financing was not strongly evident, in contrast with the Berle-Means thesis.

The implications of the analysis with respect to monetary policy indicate first, that measures may be needed to assure a policy of monetary restraint under circumstances of high corporate liquidity, when cash balances are dishoarded to provide funds for the finance of economic activity; and secondly, that the existence of large internal sources of funds facilitates investment when the monetary authorities seek to curb expenditures.

Microfilm $4.10; Xerox $14.40. 318 pages.

COLLECTIVELY-BARGAINED MULTI-EMPLOYER PENSION PLANS

(Order No. 61-3539)

Joseph James Melone, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Dan M. McGill

The phenomenal growth of private pensions has caused widespread interest in the pension movement. The economic and social significance of private pension plans has stimulated considerable research in this area. However, a comprehensive analysis of multi-employer pension plans had not been made prior to this study.

A multi-employer pension plan is one in which two or more financially unrelated employers participate. Contributions are payable into a common fund and benefits are payable to all employees from the pooled assets of the fund. There are about 3,300,000 active and retired workers currently (1960) covered in roughly 800 negotiated plans.

This study is an analysis of all the aspects of 160 plans covering at least 1,500,000 employees. These plans range in size from forty to approximately two hundred and fifty thousand employees.

The scope of the study, being as broad as it is, permits many observations and conclusions. A condensation of the findings of this study permits a presentation of only the more important conclusions.

The plans' coverage is usually, but not always, determined by the scope of the bargaining unit. If negotiations are normally performed at a local level, then it is likely that the pension plan's coverage will be local. A flat benefit which does not vary with years of service is still popular among multi-employer plans. However, plans established in recent years indicate a distinct preference for a benefit which does vary with the pensioner's years of service. Benefit formulas based on compensation are seldom used. Benefits, supplementary to the normal pension, are available in many plans. Disability retirement benefits are provided by approximately two thirds of the plans. A quarter of the plans provide early retirement and/or vesting benefits. A combination of all three benefits is available in only five per cent of the plans.

Less than two per cent of the plans studied are contributory. In a few cases, employees are permitted to contribute in their own behalf during periods of self-employment or unemployment. Only thirteen of the plans are insured; twelve are split-funded; and the remainder are trusteed plans.

The assets of trusteed plans are administered by corporate or personal trustees. Investment policy does differ by type of administration. Personal trustees showed a marked preference for governmental bonds and mortgages, whereas corporate trustees invested more heavily in industrial bonds and common stocks.

This study does not attempt to determine the actuarial soundness of these plans. However, empirical data on the actuarial assumptions utilized by selected plans are presented and evaluated in the study. Comments on various provisions and aspects of the plans which have a bearing on financial soundness are made where pertinent.

These plans are administered by a joint board representing management and labor equally. As a result of the practical workings of these joing boards, it is quite possible that the administration of the plan will be union

dominated. This fact of itself does not militate against the use of joint administration. Both management and labor must be made to fully appreciate their responsibilities as trustees of employee benefit funds. A properly functioning joint board may well be one approach to this required mutual education of management and labor.

Multi-employer plans are subject to essentially the same types of federal and state regulation as are single-employer plans. Trusteed multi-employer plans embody in many respects the characteristics of an insurance scheme. However, it is concluded that these plans should be specifically exempt from insurance type state regulation because current insurance regulation does not fully appreciate the social and economic implications of private pension plans.

Microfilm $3.80; Xerox $13.50. 296 pages.

ECONOMICS, HISTORY

EMERGING ELECTRONIC DATA PROCESSING AND ITS RELATION TO OFFICE EMPLOYMENT AND COSTS, 1930-1957: AND IMPLICATIONS FOR BUSINESS TRAINING. (VOLUMES I AND II).

(Order No. Mic 61-2549)

Mary Adele Frisbie, Ph.D.
New York University, 1961

Chairman: Dr. Peter L. Agnew

To determine which office occupations are being affected by electronic data processing equipment and the training implications which can be set forth for training office workers, this study embraces the technological changes in digital electronic data processing equipment from 1932 to 1958, trends in office employment accompanying the introduction of the equipment, and an examination of major cost factors associated with the changing office mechanization. In addition, experiences of users of the electronic equipment are examined to provide a framework for evaluation.

Procedures

Beside presenting an historical analysis of the progress of electronic equipment in this area, selected office occupations are analyzed so that the direction of each might be determined. In the absence of wage data for the United States, Bureau of Labor Statistics data for selected cities of the four sectors of the United States are examined. Because data presented by the Census of Manufacturers has not yet separated electronic office equipment from other types of accounting machines, it was necessary to compute a basis for measuring growth. Based on the market value of each kind of equipment and the number of each system in operation, the magnitude of electronic equipment was established, as well as the average capital investment of electronic computers per clerical worker. Lastly, the results of a questionnaire returned by users of digital electronic systems are analyzed to gain insight into the companies' experiences in use of the equipment and necessary adjustments in numbers of employees displaced and retrained.

Findings and Conclusions

Numbers of automatic electronic systems handling business applications have grown from a handful in 1950 to 2,107 installations in 1958. When this rate of growth is expressed in terms of average capital investment in electronic data processing per clerical worker, an increase of more than 6,700 per cent is found for the 1951-1958 period. Industries employing the larger proportions of office employees--manufacturing, federal government, insurance, public utilities, and banking--constitute the leading users of electronic equipment.

Displacement of workers does result from the installation of the electronic systems, and four methods are employed to handle such problems. These methods are attrition, layoffs, transfers, and retraining, retraining being the most frequently used means of adjusting differences.

Needs for college and high school training of office workers are shifting; however, there remains a place for vocational business training on the high school level. Also, companies are aware that it must be their role to train executives in possibilities of the electronic systems. Agreement as to the direction of training for office managers, accounting clerks, general clerks, calculating machine operators, tabulating machine operators, and key punch operators acknowledges the colleges and the high schools. For other office occupations, companies show little consensus as to training needs.

Implications for Training

First, colleges concerned with the training of those who will assume posts as office managers and accountants in companies employing electronic equipment should so plan their programs so that students are encouraged to engage in logical thinking and in decision-making based upon quantitative data. Second, it is the responsibility of the college to orient students in areas of current technological developments in order to create an awareness of ways in which electronics may affect future operations of the office.

Within the business curriculum of high schools whose graduates are employed by manufacturing, transportation, communication, public utilities, insurance, or federal offices, orientation to electronics, the types of employment opportunities, and needed aptitudes is essential.

Local businesses should work with educational representatives to endeavor to determine ways in which the schools may more effectively prepare students for their roles in companies employing electronics.

Microfilm $8.10; Xerox $28.80. 640 pages.

ECONOMICS, THEORY

INTEGRATED TECHNIQUES FOR REGIONAL PROJECTION AND POLICY FORMATION

(Order No. 61-3490)

David Frederick Bramhall, Ph.D.
University of Pennsylvania, 1961

Supervisor: Walter Isard

Policy makers, acting in behalf of the "public interest" and "general welfare," must make decisions as to present actions which will lead to preferred future situations. In order to do so they require models which order the elements of the (social and) economic complex and derive connections between elements which may reasonably be expected to persist into the future. We have been, until very recently, particularly lacking in models which deal explicitly with the spatial structure of economies.

A Regional Allocation Model is proposed as an aid to policy making which is concerned with the locational aspects of the economy. This model has the following salient features:

1. The regional projections are allocations of a national projection with extensive sector detail including interindustry consistency. National sector totals are exogenous to the analysis of regional levels, and thus are invariant with changes in regional distribution.
2. Sectors are divided into three categories, with the regional allocation of each determined in a different way.

Although an interregional input-output accounting scheme is used throughout the analysis to insure consistency of results, the customary assumptions concerning linearity of functional relations are made only with respect to the first sector category. Therefore, only for this category are regional sector levels determined by an inverse matrix multiplication.

The regional sector levels of the second category of sectors are projected by means of Weberian comparative cost studies. This reflects the fact that the location of these sectors is sensitive to transport costs and to economies of scale, localization, and urbanization.

The third sector category contains the customary final demand sectors whose outputs are primary inputs to the system. The regional levels of each of these sectors are determined by the requirements for that sector's output in each region.

3. Beginning with a tentative initial regional allocation for all sectors, a process of iteration or successive approximation is used to derive regional sector levels which are consistent with each other, with the criteria for each sector category, and with the national projection employed.

A number of typical targets of public policy are expressed in the notation of the Regional Allocation Model. The policy makers' instrumental variables are also briefly discussed in the same terms.

A critical evaluation indicates a number of deficiencies associated with the use of the Regional Allocation Model by policy makers. Among these are its inability to trace time paths of changes in target variables; the necessity of assuming identical regional technologies and final demand patterns; and an incomplete and inconsistent treatment of prices. Against these weaknesses may be weighed the advantages of flexibility and consistency. In addition there are suggested modifications of the Regional Allocation Model which partly overcome several of its present inadequacies. Microfilm $2.75; Xerox $7.00. 148 pages.

SOME FACTORS AFFECTING THE LOCATION OF ECONOMIC ACTIVITY AND THE SIZE DISTRIBUTION OF INCOME

(Order No. 61-3558)

Eugene Smolensky, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Richard A. Easterlin

Problem: To isolate those factors that have been making for parallel and those making for diverse movements through time of the size and spatial distributions of income in the United States since 1919.

Method: The study is almost entirely empirical although there is one theoretical chapter. For each distribution a summary statistic is defined. Factors causing each statistic to change over time are isolated and evaluated using familiar standardization (index number) procedures.

Results: (1) During the years 1919 to 1950 trends in income inequality in the national size distribution were quite similar to trends in the relative dispersion of state per capita incomes. There were, however, important differences in year-to-year changes between the distributions. The over-all trend is toward equality, although the per capita income of the most prosperous income groups and states rose relative to the average in the 1920's.

(2) Changes in the size and spatial distributions of income are related to changes in the functional distribution of income. Changes in the distribution of employee compensation have had a markedly similar impact on both income distributions, especially in the period of convergence. Changes in the distribution of entrepreneurial income on the other hand, have had opposite effects on the two distributions. When employee compensation and entrepreneurial incomes are merged, the effect of employee compensation dominates, so that changes in the distribution of participation income has had similar effects on the size and spatial distributions. Changes in the share of property income in total personal income are considerably more important for the size distribution (especially for the top percentile) than for the spatial distribution.

(3) On the basis of extremely skimpy data and questionable techniques, it is tentatively concluded that changes in participation rates have been considerably less important than earnings rate changes in reducing income inequality.

(4) The continuous shift of labor out of agriculture into other industries is an important factor making for reductions in income inequality over size and space. Changes in earnings per worker in the two sectors made for divergence in the twenties and convergence thereafter. In any short period, movements in earnings are more important than labor force shifts. For the size distribution, earnings changes are also most important in long periods, but for the spatial distribution during the entire period 1920-1950, the movement of labor out of agriculture is the dominant factor making for convergence. Changes in agricultural earnings per worker are generally more important than non-agricultural earnings changes, although this is not true for the top five percent of income recipients. Changes is the distribution of agricultural earnings per worker are so important not because they are larger in the low income states but because they affect larger numbers of workers.

Conclusion: Viewing the economy as composed of two sectors -- agricultural and non-agricultural-- is a useful approach to the problem of income inequality because of the unique position which agriculture has held in our society for so long. Since the size and spatial distributions are related to each other by the concentration of low income farmers in low income regions it seems plausible to approach the problem of national income inequality, at least from the point of view of ameliorative policy via regional development. A national policy which provided more rapid industrialization of the southeast by exploiting its locational advantages would significantly reduce the relative position of the upper income groups.

Microfilm $2.75; Xerox $8.80. 192 pages.

EDUCATION

EDUCATION, GENERAL

THE ADAPTATION OF HIGH SCHOOL MATHEMATICS TO MASS EDUCATION: 1915 TO 1925.

(Order No. 61-3417)

Lewis Jay Berenson, Ph.D.
Columbia University, 1961

This study interprets changes in the content, organization, and sequence of high school mathematics between 1915 and 1925. It directs attention to the influence of mass education upon curriculum revisions at this time.

The investigation reveals that during this decade mathematics educators were preoccupied with reorganizing offerings in grades seven through nine to accommodate a broadening span of intellectual abilities which equalization of educational opportunity had produced. Above grade nine, however, where instruction served principally to prepare a select group for college, little revision of content occurred.

The study further disclosed that changes which eventuated in grades seven through nine emphasized educators' desires to popularize mathematics and to discredit charges that the subject had little functional value. The trend in these grades to make content more interesting, facilitate comprehension, and stress common applications of mathematics was so strong that it stimulated some similar revisions of advanced courses. On the other hand, efforts to minimize intellectual demands of junior high school courses because of the heterogeneous student body they served had little effect upon advanced elective courses where the influence of college entrance requirements resisted inclinations to sacrifice standards in the face of mass education.

The earlier beginning of secondary mathematics provided by the junior high school prompted plans for adding new advanced content into the twelfth year. Proposals to introduce new courses such as calculus were geared to the view of a six-year high school as a means of accelerating progress in specialized fields. Such aspirations, however, were in opposition to the revised conception of the junior high school years as a period of gradual adaptation to the work of the senior high school. Plans for adding advanced content into high school mathematics gradually lost their appeal.

An examination of revisions in the sequence of secondary mathematics uncovered few trends. The arrangement of content at the senior high school level remained stable. The junior high school courses presented a variety of topical orders. The only significant tendency was the gradual introduction of the topics of graphs, negative numbers, formulas, and equations into the early part of the algebra course. This move focused attention upon features of algebra having reference to life and de-emphasized stress upon mechanical manipulations which previously highlighted the course.

Educators' concern for organization of material was more pronounced. A growing acceptance of the view that the child was an active participant in the learning process rather than just a "tabula rasa" promoted the popularity of unified mathematics which de-emphasized the logical development of subject matter for the sake of psychological considerations. Above grade eight, however, attempts to reorganize mathematical content were unsuccessful due largely to the regulatory power of the College Entrance Examination Board and force of tradition.

An appraisal of changes in high school mathematics between 1915 and 1925 in the light of contemporary courses points up difficulties that educators encounter in introducing innovations. Despite formation of the National Council of Teachers of Mathematics and the National Committee on Mathematical Requirements, bodies which should have helped channel and develop rich educational initiative,

the rate of revision of secondary mathematics has been slow. Microfilm $3.15; Xerox $11.05. 244 pages.

A COMPREHENSIVE ANALYSIS OF THE CURRENT COMMUNITY PARTICIPATION OF SELECTED WASHINGTON STATE UNIVERSITY GRADUATES

(Order No. 61-3233)

Donald Hubbard Duncan, Ed.D.
Washington State University, 1961

Chairman: W. H. Crawford

This study was concerned with the analysis of current community participation of two selected groups of graduates from Washington State University. The experimental group were formerly very active in organized student activities and were subsequently chosen as Outstanding Seniors by a student-faculty committee. One hundred forty-nine men and women comprised the active group (experimental) who were selected from the four graduating classes of 1952, 1953, 1954, and 1955.

A control group of graduates who had been nonactive in organized college activities were then selected by the investigator from the same graduating classes using sex, college major field, grade point average, and Greek or independent living group affiliation as criteria for matching individuals in the two groups. Most individuals in both groups had had adequate time to become established in their communities.

A questionnaire was constructed that would sample both the type and degree of current community participation as well as selected personal data. Community organizations were divided into ten groups to compare type of participation: Professional, Adult Education, Religion, Patriotic and Community Betterment, Economic, Recreational, Fraternal, Welfare, Avocational, and Luncheon and Benevolent. Five to eight representative organizations were listed under each major group which would be consistent in character and functions.

The degree of participation in specific organizations was measured and quantified by allowing one point for "attending less than half" the meetings, two points for "attending more than half" the meetings, and three points for "attending all" the meetings or functioning as a "leader." It was then possible to quantify and compare the degree of participation in the ten major types of community organizations, and total degree of community participation.

The t and chi tests were used to test the hypothesis that no significant difference in the type or degree of current community participation would exist between the active and nonactive groups. The 5 per cent level of confidence was used to accept or reject the null hypothesis, namely, that no differences would exist between the two groups.

An analysis of the data revealed no differences in participation in current community organizations between the two groups when the ten types of organizations were considered separately other than what would occur by chance. Neither were there any significant differences between the two groups when the total points of those "attending less than half" the meetings, "attending more than half" the meetings, and total participation in the ten types of organizations were compared. However, when total points for "leadership" and "attend all meetings" were summated for all ten types of organizations, the null hypothesis was rejected at the 5 and 1 per cent levels, respectively. This might infer that participation in organized college activities encourages the graduates to continue to be involved in community organizations as "leaders" and to "attend all meetings." It should be noted also that 51 per cent of the active men went on to graduate school as compared to 23 per cent of the nonactive men.

This study may be considered as an exploratory attempt to use controls in evaluating the effectiveness of organized college student activities as a developer of leaders for the community of tomorrow and should serve as a stimulus for further research.

Microfilm $2.75; Xerox $4.80. 92 pages.

A STUDY OF THE RELATIONSHIPS BETWEEN PERSONALITY CHARACTERISTICS OF CLASSROOM TEACHERS AND PUPIL PERCEPTIONS OF THESE TEACHERS

(Order No. 61-3002)

Frank Conrad Emmerling, Jr., Ed.D.
Auburn University, 1961

Supervisor: John T. Lovell

Most educators agree that instructional climate is an important factor in learning. Teachers have an important responsibility for finding ways to create a climate which facilitates the pupil's learning experience.

According to the "field theorists" much more needs to be known about instructional climate and in what ways it is a reflection of the personal characteristics of the teacher.

THE PROBLEM

This study proposed to explore the relationships between certain personality traits of classroom teachers and the climate of instruction they provide, as measured by pupil perceptions of these teachers.

HYPOTHESIS

Teachers identified as being concerned with problems which are: (1) positive, (2) central, (3) self-related, and (4) related to the future will be more effective in providing an instructional climate characterized by (1) freedom of communication, (2) empathic understanding, (3) positive regard, (4) unconditionality of regard, and (5) congruence (as perceived by their pupils) than will teachers identified as having problems which are: (1) negative, (2) peripheral, (3) less self-related, and (4) related to the present and past.

For the purposes of this study the teachers identified as having problems which were (1) positive, (2) central, (3) self-related, and (4) related to the future were classified as more "open." The teachers identified as having problems which were: (1) negative, (2) peripheral, (3) less

self-related, and (4) related to the present and past were classified as less "open."

METHODS AND PROCEDURES

To achieve the purpose of this study, fifty-seven teachers attending the 1960 Summer Workshop at Auburn University, which was sponsored by the Cooperative Program for Instructional Improvement, were administered a Problems Q-sort instrument. Of this number, two teacher groups of ten each, representing extreme ends of the scoring range were selected on the basis of how they perceived their most-pressing and least-pressing problems.

Since it was hypothesized that these teacher groups would be seen differently, a random sample was taken from all of the children the teacher was presently teaching. Only those pupils who were absent, or unable to read, were excluded from this sample.

Two instruments were employed to determine how the pupils of each teacher group would perceive their instructors in terms of five variables which are identified as: empathic understanding, level of regard, unconditionality of regard, congruence, and student-centeredness.

The instruments employed were the "Relationship Inventory" and the "Schuman Student-Centeredness Scale."

A study was made of pupil perceptions of the way the pupils believe their teachers perceive them and of the characteristics of the instructor they were rating. This was accomplished for the purpose of finding out if there was a significant difference between the way pupils of the two groups saw the personality characteristics of their teachers.

The differences found between the way students perceived the two teacher groups were analyzed by means of analysis of variance.

MAJOR CONCLUSIONS

The data gathered strongly support the hypothesis. All variables measured by the Relationship Inventory were found to be significant at more than the .0001 level of confidence with the exception of congruence which had a probability of .001. Student-centeredness as measured by the Schuman Student-Centeredness Scale was also found to be significant at the .0001 level of confidence. Teachers who were selected as more "open" were seen by their students as significantly more empathically understanding, more positive in their regard, more unconditional in their regard, more congruent, and more pupil-centered.

From the point of view described in this study, it was accepted that the conditions which were investigated really constitute the qualities of "good" teaching.

Microfilm $2.75; Xerox $9.00. 199 pages.

TELEVISION PROGRAM PREFERENCE AND TELEVIEWING HABITS OF CHILDREN AS RELATED TO THEIR SOCIO-ECONOMIC STATUS

(Order No. Mic 61-2111)

Malcolm Friedman, Ph.D.
Yeshiva University, 1957

Scope

This investigation was designed to obtain information about the televiewing habits and program preferences of children from three socio-economic levels. The questions investigated were:

1. How much time do children spend in televiewing each week?
2. What types of programs are preferred in each socio-economic group?
3. Do children view programs classified as suitable by:
   a. National Association for Better Radio and Television.
   b. Junior Scholastic magazine section on Lookables and Listenables.

Procedure

A pre-tested questionnaire and seven-day television diary were employed to gather data. These were administered to a sixth grade population of 160 children in each of three socio-economic areas.

Results

1. High socio-economic area children view 15 hours per week. Middle socio-economic area children view 23 hours per week. Low socio-economic area children view 29 hours per week.
2. Bedtime in all areas is associated with the time when televiewing ceases.
3. Few parents prohibit specific programs in all groups.
4. Viewing during dinner is prevalent for all populations.
5. Situation comedies, westerns, and adventure programs are favorite categories of programs for all groups.
6. Peak viewing period for low socio-economic area children is 5 to 7 P.M. High socio-economic area children view mainly during 7 to 9 P.M.
7. Few children view programs recommended by the two organizations cited above.

Microfilm $2.75; Xerox $6.80. 141 pages.

THE RELATIONSHIP BETWEEN TIME SENSE, EVALUATING INFORMATION, AND ACHIEVEMENT IN AMERICAN HISTORY.

(Order No. 61-3666)

William Earl Gardner, Ph.D.
University of Minnesota, 1961

Co-Advisers: Edith West and
Robert J. Keller

The purpose of this study was to investigate the relationships between achievement in American history and teaching the two abilities of time sense and evaluating information. The basic question was: Does teaching these two abilities in a history course produce as great or greater achievement than does teaching history with no attention to their development?

The study was conducted over a five-month period at the University of Minnesota High School. The seventh grade pupils who comprised the population were of above average academic ability and came generally from the upper socio-economic levels.

Classes in the study were taught American history from a chronological, narrative point of view. Three major units were covered during the experimental period.

Three groups were selected randomly from the population and were assigned randomly to receive a certain treatment. Experimental Group I was taught the three units with a heavy emphasis upon developing the abilities of time sense and evaluating information. Experimental Group II was taught the same topics but with a moderate emphasis upon the two abilities. The Control Group studied the same topics with review substituted for instruction in the two key abilities. All groups spent the same amount of time in the study of history.

Two California Tests in Social and Related Sciences, four teacher-made tests, and two skills tests were used to evaluate achievement. The two California Tests and the two skills tests were administered as pre- and post-tests to obtain a measure of growth.

The data were examined by the analysis of variance and covariance techniques. Hypotheses were rejected at the one per cent level, considered in doubt between the one and five per cent levels, and accepted beyond the five per cent level.

The statistical analysis yielded the following results:

1. Generally, the treatment groups scored equally as well on the various tests. In several instances, however, significant differences were found favoring Experimental Group I.
2. Experimental Group I made significantly greater gains on the two California Tests. On the Wilmeth Test, this group also made greater gains, but these were in the region of doubt.
3. In general, the same pattern of results was obtained for intelligence subgroups as for the total treatment groups.
4. Analysis of data from the groups divided on degree of skill in the two abilities revealed that most often there were no significant differences in achievement among either top or bottom skills subgroups.

Several general conclusions were drawn:

1. A heavy emphasis upon teaching these skills was directly associated with achievement in American history.
2. The positive relationship between teaching skills and achievement in history was not more apparent with either high or low intelligence levels.
3. Growth in time sense was best developed when a heavy emphasis was placed upon this ability in the American history course.
4. There was no evidence to reveal how the skill of evaluating information may be best developed; nor was a clear, direct relationship established between teaching this skill and achievement.

The general recommendation was made that skills, particularly those of time sense, should be a part of courses in American history. The true effects of skills teaching are not discernible, but pupils who study skills in history achieve better than those who do not.

The study should be replicated using populations from different locales and backgrounds. More research is needed to determine the relationship between achievement and each of the skills involved, between achievement and degree of skills emphasis, and between teaching of skills and interest in history. Additional research is needed on grade placement of the various skills.

Microfilm $3.55; Xerox $12.40. 273 pages.

PROPOSED PROGRAM FOR THE IMPROVEMENT OF COLLEGE INSTRUCTION AT FLORIDA AGRICULTURAL AND MECHANICAL UNIVERSITY

(Order No. 61-3207)

Anne Richardson Gayles, Ed.D.
Indiana University, 1961

Chairman: Arthur Hoppe

The Problem

The central concern of this study was focused upon the upgrading of teaching and learning at Florida Agricultural and Mechanical University. The major objective was to suggest ways to enhance the learning of college students.

Procedure

The research for this study included three major activities, namely: (1) a comprehensive review of recent literature in the area of college teaching, (2) an evaluation of teaching effectiveness at Florida Agricultural and Mechanical University, and (3) the proposing of a program for the improvement of instruction and learning at the University.

Sources of data for the study included: (1) a summary of major philosophies about programs to improve college teaching, (2) research findings concerning the nature, organization and implementation of programs to improve college teaching, (3) the findings from the Purdue Instructor Performance Indicator; a forced-choice rating scale which was administered to the undergraduate students at Florida Agricultural and Mechanical University to appraise the effectiveness of college instruction through measuring student opinion of college instructors as

teachers. The population for the scale included 500 students and 50 undergraduate teachers, chosen by random sampling, of the 1960 summer session at Florida Agricultural and Mechanical University, (4) suggestions to improve college teaching and learning submitted by administrative deans, department heads, instructors and students, (5) descriptions of programs to improve college teaching submitted by 22 institutions of higher learning, and (6) viewpoints concerning programs to improve college teaching gained through interviews with 20 administrative deans of other institutions of higher learning.

Findings

The more significant findings were:

1. The college instructors ranked very high on two traits characteristic of effective college teachers, namely: "Put ideas across logically and orderly" is a trait which 89.6 per cent of the students thought the faculty possessed and "Lets students ask questions in class" is a trait which 88.2 per cent of the students thought the faculty possessed.
2. Of the 24 characteristics of effective college instructors the faculty rated high on five; possessed five other traits in the opinion of at least 70 per cent of the students; possessed four other traits in the opinion of more than 50 per cent of the student ratings; ranked low on seven of the traits; and the trait "Tries to find loopholes in his teaching, and correct them" received only 71 student ratings or 14.2 per cent of the total.

Conclusions

The general conclusions of this investigation may be summarized as follows:

1. College teaching is generally good at Florida Agricultural and Mechanical University.
2. An organized program for the improvement of teaching and learning is needed at Florida Agricultural and Mechanical University to further enhance the quality of teaching and learning.
3. Administrators, teachers and students of the University are interested in a program of evaluation and instructional improvement; they are sensitive to their needs and problems in the area of college teaching and have thought seriously about means of upgrading the quality of learning.
4. Improvement activities should be cooperatively planned and executed by all concerned; they must focus upon improving the quality of learning in terms of the accepted purposes of higher education, the sound principles of teaching and learning, and a valid psychology of college youth.
5. The program for the improvement of instruction should include: an orientation program for new teachers; in-service education; a supervisory program; and periodic evaluations of teaching effectiveness.
6. More personnel policies and practices which are conducive to personal and social adjustments on the part of the faculty and the students are needed at Florida Agricultural and Mechanical University.

Microfilm $3.30; Xerox $11.50. 254 pages.

AN ANALYSIS OF THE ORAL LANGUAGE OF FIFTH GRADE CHILDREN IN GUIDED SITUATIONS

(Order No. 61-3211)

Ruth Jean Hochstetler, Ed.D.
Indiana University, 1961

Chairman: Ruth G. Strickland

The Problem

The purpose of this study was to analyze the structure of the oral language of fifth grade children as evidenced in guided situations to determine what language patterns exist and to ascertain whether these patterns were quantitatively or qualitatively different. The study was concerned with the range in length of expressions, the patterns of syntax on two levels, the patterns of flow of speech, the amount and kinds of subordination and whether there were statistically significant differences in the use of language according to sex, intelligence, occupational status and parental education.

Procedure

A sample of 100 randomly selected fifth graders was chosen from the Bloomington Metropolitan District schools. The 55 boys and 45 girls were classified according to intelligence scores obtained from the California Short-Form Test of Mental Maturity; according to occupational status determined by the Minnesota Scale for Paternal Occupations; and according to the level of education of each parent.

Conversation of small groups was recorded mechanically for 15 to 30 minutes. From the transcriptions of the tapes, 25 expressions were arbitrarily selected for each child. These speech samples, other than brief utterances, were analyzed syntactically on two levels incorporating the concept of slots and movables on Level I and satellites and nuclei on Level II.

The data were treated statistically to determine whether there was a significant difference in the use of movables and sex, intelligence, occupational status, father's education and mother's education, and also to determine whether significant differences existed at the one per cent level in kinds of subordination used by children of varying intelligence, occupational status, father's education and mother's education.

Major Findings and Conclusions

The major findings were (1) the most common pattern was the 124 (subject, verb, direct object). (2) There were no significant differences in the use of modifiers denoting place, manner, time and cause when children were classified according to sex, intelligence, parental occupation and parental education. (3) Children in this sample used a wide variety of syntactic patterns and all types of subordination. (4) Use of subordination elements was not differentiated sufficiently between high and low intelligence levels, upper and lower occupational levels and extremes of parental education to be statistically significant at the one per cent level.

On the basis of the findings of this study and the population selected, the following conclusions seem justified.

1. The transcribed spoken language of children can be analyzed syntactically.
2. Since the spoken language of children includes a wide variety of patterns, there may be a relationship between the oral language structure children use and language structures they can learn to read.
3. There would appear to be more likenesses than differences in the use of language patterns and in the use of subordination elements by fifth grade children.
4. Sex, intelligence, and occupational status appear to have less effect on the oral language of children than has been considered to be true in the past.
5. Children at fifth grade level seem to be able to use all types of structural patterns with facility.
6. Maturity of speech habits seem to be related to the clarity with which children express themselves as shown by more precise use of patterns, a decrease in the use of "and" as a conjunction, and a hesitancy to talk unless there are ideas to express.
7. Fifth grade children seem to have experienced a "leveling influence" in their language development which may be attributable to their experiences with mass media.

Microfilm $2.75; Xerox $7.60. 162 pages.

AN ANALYSIS OF STUDENT EXPENDITURES IN HIGH SCHOOLS FOR GIRLS STAFFED BY THE SISTERS OF PROVIDENCE OF ST. MARY-OF-THE-WOODS, INDIANA.

(Order No. 61-4446)

Sister Marie William Hoerner, S.P., Ph.D.
Indiana University, 1961

Supervisors: Howard T. Batchelder and
H. Glenn Ludlow

PROBLEM

The purpose of the study was to analyze the expenditures incurred by girls in certain Catholic high schools during one semester to ascertain whether these expenditures exert undesirable pressures and whether curtailment is feasible.

PROCEDURE

In this descriptive-survey, the instrument designed for collecting the data was a questionnaire to be filled out by the students. Expenditures were listed under three headings: course work, extracurricular activities, and general school functions. Transportation and school uniforms were included.

All students in the eight high schools for girls staffed by the Sisters of Providence kept accounts of school-related expenditures for the first semester 1960-1961.

An introductory letter to the principal and explanatory notes to the students accompanied the account sheets which were distributed in September 1960. Under the direction of homeroom teachers, the students kept records up to date at a weekly homeroom period. Monthly letters clarified details and stimulated interest.

A four-page questionnaire based on the account sheets was prepared, edited, and mailed to the participating schools in January. Detailed general directions to be read verbatim at the time the questionnaires were administered unified the interpretation. To increase uniformity, the principal was requested to administer the questionnaires to the entire student body, class by class.

FINDINGS

Completed questionnaires furnished 2,487 usable forms representing 2,621 students in parochial, private, and diocesan high schools in Indianapolis, Vincennes, Chicago, Joliet, Chelsea, Malden, and Washington, D.C. Enrollments ranged from 124 to 890. Data were compiled according to measures of central tendency and variability, and findings were tabulated and analyzed.

Reported expenditures were studied in relation to family socio-economic status based on parental occupation and classified according to the fivefold Sims classification as adapted for the study.

Further findings were related to financial limitations as affecting choice of courses, participation in extracurricular activities, and participation in the general school program. Another area of the study was directed to student reaction regarding the use of a school uniform and reasons for reported satisfaction or dissatisfaction.

CONCLUSIONS

Extreme variability characterizes the expenditures from one school to the next. For example, the combined mean for textbooks at one school was $18.02; at a second school it was $8.83.

Remarkable consistency is evident in the expenditures reported from one grade to the next within the same school.

Broad range of reported expenditures invariably appears in the data for each item. To illustrate, reported expenditures for uniforms in ninth grade at one school showed a median of $29.90 and a range of $10.00 to $91.60.

No regular increase in expenditures appears from one grade to the next.

A positive relationship between family socio-economic status and reported expenditures seems to exist in six of the eight schools. The other two schools exhibit variability in this relationship.

Expenditures in private schools exceed those in parochial schools, allowance being made for tuition.

As a whole, the findings do not indicate that the reported expenditures exert undesirable pressures on these students. The percentage of students at the various grade levels who reported that financial restrictions interfere with their choice of courses or activities was regularly 10 per cent or less of the respective grade groups.

An overwhelming majority of students consider a school uniform highly desirable, and large numbers deem it satisfactory for reasons related to economy.

Microfilm $4.85; Xerox $17.10. 377 pages.

ACCOUNTING EDUCATION IN ARKANSAS, KANSAS, MISSOURI, AND OKLAHOMA.

(Order No. 61-3188)

Milburn Judson Little, Ed.D.
University of Arkansas, 1961

Major Professor: Roy B. Allen

The purpose of this study was to trace the growth and direction of accounting instruction in five universities and to determine to the extent possible the historical reasons for such growth and direction. The elements investigated were curriculum offerings, training and experience of the instructor, extra-class instructional activities, and other activities that might affect the instruction of accounting.

The study was limited to five selected universities on the assumption that they are and have been leaders in accounting instruction in their respective states. The five universities are the University of Arkansas, University of Kansas, University of Missouri, University of Oklahoma, and Oklahoma State University.

Accounting was first taught as follows: University of Kansas in 1904; University of Missouri in 1910; Oklahoma State University in 1915; University of Oklahoma in 1916; University of Arkansas in 1918. The courses were first offered in Schools of Arts and Sciences and were taught by Professors of Economics or others not particularly qualified to teach accounting. There is little doubt that accounting education grew in response to the needs and demands of business enterprise. The first offerings included Farm Accounting but this was soon replaced by the more conventional accounting and auditing courses and by titles indicating modern specialized fields. The first accounting courses were elective and did not attain the status of "major subject" until the late 1920s.

Schools of Business were established at each of the five universities — in Missouri and Oklahoma prior to 1915 and in Arkansas and Kansas in the mid-1920s. From the late 1920s all schools recognized the necessity for accounting training in three areas — public, commercial and industrial, and governmental, but public accounting seems to have been emphasized.

Cost Accounting, Corporation Accounting, and Income Tax Accounting appeared and were enlarged and expanded concurrent with the growth of industry, the corporate form of business enterprise, and the ever-greater needs of the government. High speed computer courses and many types of so-called managerial accounting courses have recently been added to the curricula, again reflecting the need of business. Most of the schools expanded their course offerings greatly in the last ten years, primarily because of new doctoral programs.

Total hours in accounting required for the accounting major has been virtually unchanged in the last 30 years. Only at the University of Kansas has there been a reduction in this requirement, and this occurred incident to adoption of a 5th-year professional training program. Graduate programs with majors in accounting are of fairly recent origin. Only the University of Missouri has offered the doctoral program in accounting for any length of time — since 1940.

All schools employed at least one C.P.A. as early as 1930. Instructors holding doctor's degrees were not employed by two of the universities until 1950. Since 1950, over 50 per cent of the teachers of accounting have held the C.P.A. certificate. In recent years there has been increased employment of instructors holding the doctor's degree.

The emphasis upon training for public accounting seems to have undergone some change in recent years. There is evidence of much more counseling with students and of emphasis of a broad, liberal education.

Extra-class instructional activities have been held to a minimum. The prevailing attitude seems to be that there is little time for other than formal instruction in the accounting classroom.

There is much evidence of continuing self-criticism. All concerned with accounting education are aware of such problems as well-rounded education vs. professionalism, properly trained accounting instructors, and the criticism that accounting education has made no progress in many years. Microfilm $2.75; Xerox $9.00. 200 pages.

A DESCRIPTIVE STUDY OF THE SYNTACTIC STRUCTURES IN THE LANGUAGE OF CHILDREN: NURSERY SCHOOL AND FIRST GRADE.

(Order No. 61-3361)

Paula Menyuk, Ed.D.
Boston University School of Education, 1961

Purpose

The purpose of this study was to use a new explanatory model of grammar (Chomsky's Model of Syntactic Structures) to determine if it was capable of describing a children's grammar as a self-contained system and of indicating developmental trends.

Procedures

A sample of 48 private nursery school children (mean age 3 years, 7 months) and 48 first grade children (mean age 6 years, 5 months) comprised the population. There was no significant difference in the mean I.Q. of the nursery school and first grade children. The mean I.Q. was 130.29 for the nursery school group and 131.96 for the first grade group. Also, no significant differences were found in the mean age and I.Q. of the males and females.

Language was elicited and tape recorded in three stimuli situations: 1) spontaneous speech in response to The Blacky Pictures, 2) conversation with an adult (the experimenter), and 3) conversation with peers. In addition, the language used in the classrooms of the sample population was transcribed for cross-validation purposes. A minimum of 50 sentences was obtained from each child. The language sample contained 8574 sentences obtained in the tape recorded situations and 1009 obtained in the classrooms.

The language sample of each child and of the classroom groups was analyzed using Chomsky's technique. A grammar was written which included all the rules used at both age levels to generate the sentences obtained. Using the Chi Square technique, comparisons of the number of children using the structures found in children's and adults'

grammar were made between: 1) nursery school and first grade, 2) males and females and 3) children above and below the mean I.Q. The same comparisons were made of the usage of structures restricted to the children's grammar.

Results

The basic structures which generated all the sentences obtained could be described within the framework of the Chomsky model. A children's grammar was written which includes those structures found in both children's and adults' grammar and those structures which are restricted to the children's grammar.

All the structures used by adults to generate their sentences are found in the grammar of the nursery school group. In comparing the number of children at the two age levels who used these structures it was found that most of the structures are acquired at the three year age level and are used consistently. The structures which are still in the process of being acquired at the nursery school level are also in this process at the first grade level.

The structures which are restricted to the children's grammar occur infrequently. It was found that significantly more of the nursery school children were omitting the rules which are obligatory once a structure has been optionally chosen. In addition, a trend from omission to redundancy with lessening fluctuation was observed, in the course of the maturational development toward a zero usage of unique structures at the phrase structure and morphology level of the grammar. There were few significant differences in the usage of all structures in the children's grammar by males and females or by children above and below the mean I.Q.

Conclusions

It is concluded that the Chomsky model is capable of describing a children's grammar as a self-contained system and of indicating developmental trends. The model gives us a technique for looking at grammatical development in new and insightful ways both for normative and comparative studies.

Microfilm $2.75; Xerox $4.60. 88 pages.

A HISTORY AND CRITICAL EVALUATION OF THE COURSE 'PROBLEMS OF AMERICAN DEMOCRACY' IN THE SECONDARY SCHOOLS OF THE UNITED STATES.

(Order No. 61-4504)

Irene Eldridge Mitchell, Ed.D.
The University of Oklahoma, 1961

Major Professor: Lloyd P. Williams

The research traced the history of the social studies from Colonial America to the present time with overtures from the philosophical writers of the Renaissance. A critical evaluation of the social studies curriculum was made in three phases: (1) examination of textbooks published from the Civil War period until the World War I, (2) reading available pedagogical literature describing the 'Problems' course and the experimentations from 1920 to the present time; and (3) investigation of available state courses of study describing the course, qualifications of teachers, and suggested supplementary aids in teaching.

The six major divisions of the study cover the history of the social studies movement in American secondary education and the development of the 'Problems' course. The evaluation of the course critically considered the status of the social studies course from the viewpoint of administrators, teachers, and philosophers of education. The adequate and the inadequate characteristics of the teacher in handling the course were recorded with special consideration to teacher-training.

Conclusions are that the course 'Problems of American Democracy' should:

1. Elucidate the process of democracy.
2. Illuminate the basic social, economic, and political concepts.
3. Develop critical thinking.

Recommendations made:

1. Revitalize the social studies curriculum.
2. Re-evaluation of the teacher-training program and the qualifications for certification of social studies teachers.
3. Improve the problem-solving approach to learning.

Trends observed:

1. Create a National Curriculum Center.
2. Reorganization of the teacher-training program.
3. Research to find the value in group dynamics in providing experiences in problem-solving techniques.

Microfilm $2.75; Xerox $5.40. 107 pages.

THE CONSTRUCTION AND EVALUATION OF A SERIES OF EXERCISES IN CREATIVE DRAMA

(Order No. 61-3363)

Raymond Louis Picozzi, Ed.D.
Boston University School of Education, 1961

It was the purpose of this study to construct and evaluate a series of exercises in creative drama. These exercises were planned to assist children in developing a play from a story.

The Material:

The material was tried out in twelve sixth grades with a total population of 262 children. The classrooms in the study were all located in a community adjacent to Boston.

Preliminary Tests:

Preliminary tests were administered in March, 1960, to all the children involved in the study. These tests consisted of an intelligence test, a drama test, a standard reading test, and the Bogardus Social Distance Scale. The children were arranged in small heterogeneous groups on the basis of I.Q. and school performance. They were recorded in a play performance during this period. Names of the children were carefully tabulated in order that the same groups would perform at the end of the study.

Final Tests:

Final tests were administered in May, 1960. These tests consisted of all the above except the intelligence test. The children's groups were reassembled for the final recording of a play performance during the period. The period between the preliminary tests and the final tests was occupied by ten lessons of one hour each which were given over seven weeks of instruction.

The play production of both the pretesting and post-testing situations was tape recorded as stated and at a later date analyzed by a group of raters using the rating scale on drama factors constructed by the writer.

All the Materials:

All the materials used during the seven-week period of instruction were constructed by the writer. These exercises developed the following factors of drama:

1. The concept of the playwright and the plot
2. The identification and creation of characters
3. The identification and writing of dialogue
4. The study of climax and how to develop this high point in a play
5. Scene identification and development.

After every instructional lesson the children were provided with a work sheet to enhance and enrich the lesson. A review followed every two lessons.

The drama test was also constructed by the writer.

Measures of Reliability:

Measures of reliability were obtained on the drama test after use with a trial population. The reliability achieved was .64. The test was revised for use in the study.

The Rating Scale:

The rating scale was used to measure and analyze the tape recordings. The coefficient of reliability obtained here was .89.

The data were analyzed to answer the following questions:

1. Was there any gain in group ability to produce a play from a story?
2. Was there any gain in knowledge of drama as measured by the drama test?
3. Was there any gain in reading ability?
4. Was there any change in position in the group as measured by the Bogardus Social Distance Scale?
5. Was any single factor such as Intelligence Quotient, Drama Information, or Reading closely related to drama ability?

Conclusions:

The conclusions obtained follow:

1. After using the material, there was gain in group ability to produce a play from a story. The critical ratio obtained between pretesting and final testing was 8.144 which is statistically significant.
2. As measured by the drama test, there was gain in knowledge of drama. The critical ratio obtained here was 5.518 which is statistically significant.
3. A critical ratio of 2.420 was obtained on the reading test. This is not statistically significant at the .01 level set up for this study, but is very close and is significant at the .05 level. It does indicate some significant changes in reading.
4. The Bogardus Social Distance Scale administered before and after the teaching material yielded a critical ratio of .510 which is not statistically significant.
5. None of the factors isolated and studied such as Intelligence Quotient, Drama Information, or Reading showed any significant relationship to drama ability.

Microfilm $2.75; Xerox $8.40. 181 pages.

A COMPARATIVE STUDY AMONG 4-H GIRLS OF FOUR YEARS AND OVER, ONE AND TWO YEAR 4-H DROP-OUTS AND NON 4-H GIRLS OF NINTH GRADE IN TEN SELECTED COMMUNITIES OF WISCONSIN TO DETERMINE DIFFERENCES IN SCHOOL ACHIEVEMENT AND SOCIAL BEHAVIOR.

(Order No. 61-3172)

Guthikonda Venkata Subaima, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Burton W. Kreitlow

The Purpose and Procedure

The purpose of this study is to determine whether there are any significant differences in school achievement and social behavior among the three groups of ninth grade girls -- (1) those who have been 4-H members over four years, (2) those who have dropped out after one and two years 4-H experience, and (3) the non 4-H girls.

Two null hypotheses were set up to answer two major questions. (1) Is there a significant difference in school achievement and social behavior among the three groups

of girls? (2) Do 4-H Club activities have any relationship to school achievement and social behavior?

In determining the differences among the three groups of girls, eleven academic variables, chronological age and mental age were identified to determine the school achievement and eleven social, personal, and interest components were rated.

Design and Treatment of the Data

This study is a part of the Longitudinal Study of Ten Selected Wisconsin Communities directed by Professor B. W. Kreitlow. The Study sample was selected from the ninth grade girls of the ten community schools. The data from this sample were used in the analysis.

Metropolitan Achievement Test, Form R, Kuhlmann-Anderson Test H, Ninth Grade Activity Questionnaire, Questionnaire for Teacher Rating, Personal and Social Behavior Inventory, and Interest Record were used to collect the data.

The data were treated by Analysis of Variance followed by Tukeys W where the F value was significant.

Findings and Conclusions

The differences among the three groups of girls were not found to be statistically significant either in School Achievement or in Social Behavior, though F values of four variables fall in the region of doubt between 5 and 1 percent. On an average the four year 4-H girls secured the highest mean scores, and the drop-out group secured higher mean scores than the non 4-H girls, both in school achievement and social behavior.

The final conclusions are, that this study did not reveal significant differences in school achievement and social behavior among the three groups of ninth grade girls who had four years 4-H experience, who dropped out after one and two years and those who never had any 4-H experience, though the 4-H'ers exhibited superiority in most of the characteristics. The results on intelligence tests showed that 4-H experience may have improved mental ability, and it may have partial and indirect influence on school achievement.

The components selected in evaluating social behavior suggest a direct relationship to 4-H Club work; but the results are not sufficiently exact to support this statement in total. It may be worthwhile to test social behavior with a more comprehensive rating system that may permit more freedom in rating and lead to greater assurance of validity. Microfilm $2.75; Xerox $8.20. 179 pages.

ANALYSES OF SOME VALUES HELD BY THE FACULTIES OF THE COLLEGES OF THE AUGUSTANA LUTHERAN CHURCH

(Order No. 61-3685)

Carl Filip Vikner, Ph.D.
University of Minnesota, 1961

Adviser: Robert H. Beck

Purpose of the study. The study aims to describe the patterns of opinion of the faculty members of the five colleges of the Augustana Lutheran Church on three positions in educational philosophy and toward teacher education programs. Relationships between these opinions and selected faculty characteristics are also explored. It seeks to define areas of consensus and to promote the relating of teacher education to foundational beliefs.

Procedures. Four summated rating, Likert-type, attitudinal scales were constructed. Experimentalism, scientific realism, and idealism are the outlooks in educational philosophy about which scales were built; the fourth scale probed attitudes toward programs of teacher education. The corrected split-half correlation coefficient was found to be +.585 for the experimentalist scale, +.368 for the scientific realist scale, +.381 for the idealist scale, and +.844 for the teacher education scale.

The four rating scales were combined in a single questionnaire. It was answered by 159 faculty members which constituted fifty-eight percent of the sample. All five colleges were visited and school administrators were conferred with individually.

After grouping the respondents on the bases of administrative responsibility, teaching specialty, degree earned, rank, seniority, attendance at a Lutheran college, and course work in Education, comparisons among and between groups were made. A series of null hypotheses based on the status categories were posed and upheld or rejected at the five percent level of significance. Nonparametric statistical tests of significant difference were employed.

Findings. The faculties of the selected colleges have the following traits:

1. The teachers of professional education and those who have had more course work in Education tend to favor the view of experimentalism. The specialists in the social sciences have a more favorable opinion of experimentalism than do the teachers of the humanities.
2. Staff members with 8-11 years of seniority comparatively tend to dissent from the position of scientific realism.
3. Idealism is significantly more acceptable to the teachers of the humanities and of the natural sciences than to the teachers of the social sciences. Faculty members that had attended Lutheran schools favor the outlook of idealism.
4. A positive relation between the amount of graduate study and dissatisfaction with teacher education programs is present. Teachers of Education are significantly more favorable to programs of teacher education than are the faculty members with other specialties.

Conclusions. The following conclusions are made:

1. In view of the numerous differences tested, wide consensus exists in the areas measured by the scales of the study.
2. Teachers of professional education deviate significantly from other faculty members in their confidence in the programs of teacher education.
3. Lutheran college graduates and the teachers of the humanities and the natural sciences evidence a comparatively more favorable opinion of idealism.

Limitations. The conclusions are based upon about sixty percent of the sample. The reliability correlation coefficients of the scales on positions in educational philosophy are low. Only some of many hypotheses have been

tested. The study is limited to four areas of value, namely: three positions in educational philosophy and the attitude toward programs of teacher education.

Recommendations. The following three recommendations are appropriate:

1. In the colleges of the study, the issues of experimentalism and the procedures of teacher education need wider discussion if greater consensus is to be achieved within the faculties.
2. Since the study only suggests a favorable outlook toward idealism, further comparative studies of opinion on educational philosophy may substantiate the importance of idealism in the schools.
3. The opinion and attitude scales constructed for the study may prove useful in further research among teaching groups and with teacher education students.

Microfilm $5.50; Xerox $19.60. 432 pages.

BUSINESS AND ECONOMICS IN THE GENERAL EDUCATION PROGRAMS OF COLLEGES AND UNIVERSITIES

(Order No. 61-4506)

Charles R. Walker, Ed.D.
The University of Oklahoma, 1961

Major Professor: Dr. Gerald A. Porter

The problem of this study was to isolate and define the business and economic information which should constitute a part of the general education offered for all students in colleges and universities and to give consideration to ways and means of providing this kind of education. The solving of the problem involved two significant aspects: (1) a determination of whether or not any business and economic facts, principles, and concepts are particularly appropriate for study as a part of a college general education program, and (2) a determination of the means by which business and economics can best be studied in a college general education program.

Data were derived from a study of published reports of general education programs in a number of colleges and universities in the United States and from questionnaires submitted to 100 alumni, faculty members, and administrators of Oklahoma City University.

The conclusions reached from this study are:

1. Certain significant elements of business and economic information should be taught at the college level as general education for all students.
2. The major part of the business and economic information studied by all college students should be macroeconomic information; that which is pertinent to the broad functioning of our national and international economic structure.
3. A limited amount of microeconomic information relevant to the business and economic activities of the individual or family unit that is of sufficiently high academic quality warrants presentation to college students as general education.
4. Business and economics should be fused or integrated into a variety of courses and also should be included in certain kinds of special courses at the college level. The evidence is not conclusive as to which method of providing such information is better. In many colleges and universities the objective of enabling students to gain the business and economic information they need might be achieved fully only if both methods are utilized.
5. While business and economics at the college level are at present almost entirely devoted to vocational or professional education, there is evidence that certain aspects of business and economics should be made a part of the general education of all college students. Thus, additional study should be engaged in in order to determine better ways to expedite and facilitate achievement of both the general education and the professional or vocational objectives. Microfilm $2.75; Xerox $8.40. 181 pages.

A COMPARISON OF ACHIEVEMENT IN HIGH SCHOOL BIOLOGY WHEN TAUGHT TO NINTH GRADE AND TENTH GRADE PUPILS

(Order No. 61-3690)

Louis Lloyd Walters, Ph.D.
University of Minnesota, 1961

Problem

The grade placement of biology, specifically the possibility of moving biology from the tenth to the ninth grade, was the problem under investigation.

Procedure

The investigation was designed to compare achievement of ninth and tenth grade pupils on standardized tests of biology and teacher-made unit examinations. Six sections from University High School involving 144 pupils were taught identical courses during the 1957-1959 schoolterms. In 1957 the entering freshman class was randomly assigned to provide a ninth and two tenth grade sections in biology. A similar selection was made in 1958 to provide one tenth and two ninth grade sections. In order to obtain a measure of mental ability all six sections were tested with the Lorge-Thorndike Intelligence Test upon entrance into the ninth grade. Pre-tests, the Nelson Biology Test and the Cooperative Biology Test, were administered upon enrollment in biology. These tests were also used as post-tests at the end of the instructional period. Teacher-made unit tests were administered at the end of each of the eight instructional units. Comparisons of achievement of whole classes and high and low ability subgroups were made at three levels: (1) among all six sections, (2) between the two ninth and two tenth grade sections enrolled in biology in 1958, (3) between the three sections constituting each of the two entering freshman classes. The statistical analysis was done using the analysis of variance technique.

Findings

Preliminary analyses of mean scores on the intelligence test and the two standardized biology pre-tests indicated that ninth and tenth graders did not differ significantly with respect to scholastic ability or pre-existing biological

knowledge. Comparisons of mean scores on the two standardized post-tests revealed no significant differences in ninth and tenth grade achievement. Similarily no significant differences were found between the mean scores of the two grades on any of the eight unit examinations. All comparisons were made using both whole classes and high and low ability subgroups and were interpreted at the one per cent level of probability. In addition a t-test analysis of pre-test and post-test scores indicated all sections made significant gains as a result of instruction.

Conclusions

Conclusions drawn from the findings were:

1. When students had not been previously enrolled in formal courses, ninth and tenth graders were essentially homogeneous in background knowledge of biology.
2. When a full range of abilities was represented in a class, biology could be taught in the ninth grade as effectively as in the tenth grade.
3. Talented ninth graders achieved as well as did talented tenth graders.
4. For students of lower ability biology was mastered as well in the ninth as in the tenth grade.
5. A wide range of course content appeared applicable for both ninth and tenth graders.

Recommendations

Using the findings of the study the following recommendations were made:

1. Biology as it was taught at University High School should be placed in the ninth grade.
2. Research on grade placement of all science courses should be initiated.
3. Future research in grade placement should include provisions to collect information concerning other aspects of instruction in addition to subject matter mastery such as attainment of scientific attitudes, facility in using the methods of science, and development of lasting interests in scientific areas.
4. Future studies should involve greater articulation among elementary, junior, and senior high schools.
5. Future studies should include provisions for follow-up studies.

Microfilm $2.75; Xerox $9.45. 210 pages.

AN ANALYSIS OF EFFECTIVE PRACTICES EMPLOYED TO REDUCE VANDALISM IN PARK, RECREATION, AND COMBINED DEPARTMENTS IN AMERICAN CITIES OF OVER 50 THOUSAND POPULATION.

(Order No. 61-3323)

George Thomas Wilson, Re.D.
Indiana University, 1961

Chairman: Garrett G. Eppley

Problem. The problem was to analyze the reported effective practices in reducing or eliminating acts of vandalism to facilities or natural areas of park, recreation, and combined departments in American cities of over 50 thousand population.

Procedures. The procedures were to determine an acceptable definition of vandalism; to determine the cities and departments within the scope of this study; to develop a collection instrument; to collect the effective practices; to analyze the effective practices within a frame of reference; and to offer conclusions and recommendations. An adaptation of the critical incident technique was used. The 256 page study analyzed and rated 221 usable observations of practices considered by 126 reliable observers to have been effective in reducing vandalism to the facilities and natural areas of 90 park, recreation, and combined departments in five classifications of 87 American cities of over 50 thousand population.

Findings. The most important findings were: (1) circumstances of vandalism reported most frequently in order of frequency were damage to or defacement of: facilities, excluding buildings; equipment, excluding benches or tables; sanitary facilities; windows; and building exteriors, excluding windows; (2) effective practices employed most frequently in order of frequency were redesign or reconstruction; restitution in work or money by vandals; regulatory rules; immediate repair and replacement; patron involvement in planning; educational programs; making parents pay; and patrol; and (3) the category of effective practice having the highest mean of the effectiveness scores was regulatory rules followed closely by redesign or reconstruction, educational programs, and patron involvement in planning.

Conclusions. The study indicates that vandalism may be minimized by such measures as: employing principles of good design, planning, and construction; instituting preventive maintenance procedures and programs of immediate repair or replacement; involving patrons in planning; establishing sound regulatory rules; conducting educational programs; patroling; carefully selecting leadership; adequate lighting; providing programs that meet constituents' needs; and working closely with community agencies. It points up the importance of apprehending vandals and obtaining restitution in terms of work or money by vandals, or by their parents in terms of money.

Recommendations. Vandalism should be recognized as a complex problem. So little is known about it that considerable research in it should be encouraged and continued. Suggested studies are:

1. To determine the effectiveness of vandalism legislation as it relates to parental responsibility;
2. To determine the effectiveness of municipal and county ordinances, particularly as they relate to vandalism in park, recreation, and combined departments;
3. To analyze records of those departments keeping accurate field reports of vandalism;
4. To study vandalism as it relates to municipalities or towns under 50 thousand population.

Planners, contractors, and manufacturers concerned with design, planning, and construction of park and recreation areas, facilities, buildings, and equipment need to work more closely with administrators to prevent causes of costly and wasteful redesign and reconstruction.

Administrators of park and recreation departments should be the agencies that finally accept or reject suitability of designs or plans for construction prior to assuming responsibility for operation.

Job titles in park, recreation, and combined departments

were so numerous that the need for a study relating to the standardization of titles is indicated.

Information from studies such as this should be disseminated to the field through low cost publications. Fees for such publications could help provide grants for further study. Microfilm $3.50; Xerox $12.40. 271 pages.

EDUCATION, ADMINISTRATION

LEGAL ASPECTS OF INDIANA SCHOOL PROPERTY LAWS IN THE AREA OF ACQUISITION, MANAGEMENT, USE, AND DISPOSITION.

(Order No. 61-3193)

Ambrose Mack Bennett, Ed.D.
Indiana University, 1961

Chairman: Dr. Maurice E. Stapley

The official form of statutory law in Indiana is found in the Revised Statutes of 1852 and in the bound volumes of the statutes which are enacted during each session of the legislature and which are called the "Acts of the General Assembly." Usually the statutes of a particular session of the legislature are bound in one volume. When a statute is enacted, it is assigned a chapter number by the secretary of state without regard to content. In 1881, there was an official compilation of the statutes of Indiana which is the last official compilation made. Burns' Annotated Indiana Statutes is a private compilation and is the most widely used source of Indiana Statutes. A partial compilation is The School Law of Indiana which was prepared by the State Department of Public Instruction in 1946.

School officials often have difficulty in locating the statute law and principles of law which are applicable to a particular problem. It is the purpose of this study to present in one volume a survey of the statutes and principles of law which pertain to the acquisition, management, use, and disposition of school property in Indiana. The problem includes: (a) the identification of the present statute law in Indiana which pertains to the acquisition, management, use, and disposition of school property as found in Volume 6, Part 2 (Education) of Burns' Annotated Indiana Statutes, and (b) the determination of the legal principles of school law which pertain to the acquisition, management, use, and disposition of school property as found in decisions of courts-of-record in Indiana.

Sources of data used in this study include West's Indiana Digest, Corpus Juris Secundum, Burns' Annotated Indiana Statutes, Indiana Reports, Northeastern Reporter and publications of the Indiana State Department of Public Instruction.

After a careful survey of the statutes in Burns' Annotated Indiana Statutes, 67 statutes are found which relate to the area of school property. Of these, 29 relate to the acquisition of school property, 14 relate to the management and use of school property, and 24 relate to the disposition of school property. In addition, 34 court cases are reviewed as to facts stated, issues raised, opinions of the courts as to the principles involved, and the decision or decisions reached. From these cases 106 principles of law are found which pertain to the area of school property covered by the study.

From the data studied, the following conclusions are drawn:

1. School authorities are forced to waste considerable time because of the unnecessarily large number of statutes which pertain to schools.
2. There are a number of obsolete statutes which should be deleted from current legislation.
3. There is a need for more clear-cut information as to statutes that have been superseded or repealed by implication.
4. In the drafting of new legislation, insufficient attention has been given to existing statutes.
5. There are a number of statutes which pertain to the same thing and which could be combined.
6. In several instances, there are a number of special statutes which could be combined and replaced by a single general statute.
7. There is a need for a compilation of statutes which pertain to schools. This compilation should include statutes which only indirectly pertain to schools but which must be observed by school authorities.

Microfilm $4.60; Xerox $16.20. 357 pages.

MANPOWER PROBLEMS AND HIGHER EDUCATION IN IOWA: A NEW ALLIANCE.

(Order No. 61-3200)

Robert Merlin Crane, Ed.D.
Indiana University, 1961

Chairman: Raymond C. Gibson

The Problem

The problem of this study was to determine relatedness of manpower problems and higher education and to project consequences of these relationships for higher education in Iowa during the next ten years.

Source of Data and Findings

A survey of workers in the following six occupational groups as classified by the United States Census Bureau was conducted: (1) professional, technical and kindred workers; (2) farmers and farm managers; (3) managers, officials, and proprietors; (4) clerical and kindred workers; (5) sales workers; (6) craftsmen, foremen and kindred workers. Leaders from agriculture, business and industry, and education also were included.

The Questionnaire on Selected Occupations was designed to show inter-relationships by statistical analysis within and between occupational groups and their responses. Respondents marked items on a three point scale: (1) very important, (2) important, (3) not important. Returns were received from 3,652 individuals, 2,075 in occupational groupings and 1,577 leaders, with 44 occupations represented.

Weighted means of 1.50 or less, indicating an intensity

of important from "very important" to one-half of an internal below "very important" were summarized. Only preferences on this high intensity level were used in the conclusions and recommendations.

Conclusions

Iowa has changed to a predominantly industrial and business economy from an agricultural one--income from business and industry being more than twice as great as income from agriculture in 1959.

A closer relationship is needed between labor, economy, and curricula in higher education.

An increase and acceleration of professional programs in Iowa higher education is needed.

Increased employment and educational opportunities for talented youth of Iowa are needed.

Iowans believe in higher education but better public relations to bring increased understanding and support of it were called for.

Problems of Iowa higher education are finances, facilities, and curriculum.

Abilities reported as highly important to workers also have implications for higher education.

Goals of college education regarded as highly important are: learning to express one's thoughts effectively in writing and speaking, acquiring habits of critical thinking, developing skill in responsible and effective citizenship.

"Community assessment" as evidenced in studies by the Iowa Employment Security Division needs to be expanded thereby determining needs of major communities in Iowa.

Recommendations

Some recommendations for implementation of a manpower and higher education alliance follow:

1. That Iowa programs and curricula of higher education be examined and evaluated in regard to (a) their value in preparing individuals for work, (b) effective citizenship and other specific goals of higher education.
2. That opportunities be created for more capable, interested and financially needy Iowa students to attend colleges and universities.
3. That Iowa agencies, public and private, give continued support to new industries and expansion of present ones.
4. That each community with an industrial base be encouraged to make a "community assessment" study thereby determining manpower and economic resources and educational needs.
5. That all colleges and universities increase and accelerate programs for professions in the next decade.
6. That state support be given programs such as the following which are designed for the alliance of manpower problems and higher education: (1) cooperative work-study programs; (2) "institute" programs, cooperative efforts of business and industry and colleges and universities; (3) separate, comprehensive junior colleges or community colleges serving "assessed" needs of the community.
7. That self-study of internal administrative and teaching practices and programs, and external "images" be practiced by Iowa colleges and universities.

Microfilm $3.45; Xerox $12.15. 266 pages.

THE FEASIBILITY OF ESTABLISHING ONE OR MORE JUNIOR COLLEGES OR EXTENDED SECONDARY PROGRAMS IN THE NORTH CENTRAL COLUMBIA BASIN AREA

(Order No. 61-3234)

Clifford Albert Erickson, Ed.D.
Washington State University, 1961

Chairman: W. H. Crawford

The purpose of this study was to determine the feasibility of establishing one or more junior colleges or extended secondary programs in the North Central Columbia Basin area of the state of Washington. The terms "junior college" and "extended secondary" were used synonymously in this study.

Recent literature combined with State Board of Education regulations produced ten criteria which were used to determine the feasibility of establishing such an institution. These criteria were:

A: Approval of the proper state educational authority

B: Approval of the local population

C: Absence of an institution of higher education in the area served

D: Need and desire, demonstrated by a survey of the intentions of high school juniors and seniors with respect to education beyond the high school

E: Need and desire, demonstrated by a survey of the intentions of parents of high school juniors and seniors for their children's education beyond high school

F: Adequate financial resources in the form of assessed valuation and bonding capacity

G: Adequate high school enrollment in the area

H: Adequate potential junior college enrollment

I: Maximum travel distance

J: Isolation of the area and sparsity of population

Junior college enrollment potential was determined by using a revision of the Woodburne formula. This revision was necessary in order to adapt it to population conditions and travel patterns existing in the North Central Columbia Basin area.

The application of the ten criteria to the area under study produced the following conclusions:

1. It is entirely feasible to establish a junior college in the North Central Columbia Basin area. The data, however, do not support the establishment of more than one such institution.
2. The North Central Columbia Basin area is in a position financially to support a junior college.
3. In order to minimize travel and secure the largest possible enrollment, the institution, if established, should be located either in Ephrata or Moses Lake.
4. Students are willing to travel a considerable distance in order to attend a junior college in the area under study.
5. Significant numbers of students and parents appear to be willing to support a junior college in the area.

Microfilm $2.75; Xerox $4.60. 89 pages.

THE PROBLEMS OF BEGINNING SUPERVISORS IN FLORIDA SCHOOLS

(Order No. 61-3637)

Robert Guy Gilbert, Ed.D.
The Florida State University, 1961

It was the purpose of this study to: (1) identify the problems of beginning supervisors in Florida; (2) determine in what way their problems were related to selected phases of their professional or experiential background; (3) arrive at implications for university preparatory and in-service educational programs for supervisors.

The method of investigation was an oral interview using open-ended questions, a ranked list of problem areas derived from the literature, and a check list of 150 problems within the nine problem areas from the same source. The study was conducted in twenty-six Florida counties and involved forty-four beginning supervisors appointed for the school year 1958-59 or 1959-60.

The data indicated that beginning supervisors considered curriculum, establishing the supervisory program, and supervision of learning to be their greatest problems. Public relations, ethnic and national problems, and instructional aids were least often mentioned as problems.

There was little relationship between the place of origin of employment and the order in which beginning supervisors ranked the major problem areas. Supervisors coming from other counties in Florida had more problems per person than did those appointed from within the county or those coming from outside the state.

In a study of the relationship of sex to problems, it was found that the men had more problems per person than the women. Sex made a difference in the way supervisors ranked the nine major problem areas in order of difficulty but did not affect the total frequency of responses to each of the nine major areas.

The data indicated that amount of educational preparation did make a difference in the ranking of problem areas but not in the total problems encountered within each major problem area. The frequency with which problems were identified was directly proportional to the amount of education obtained.

Previous supervisory experience affected the way supervisors ranked the major problem areas but not the total problems encountered within each major problem area. Those with prior supervisory experience had more problems per person than those who did not have prior supervisory experience.

Experience as a principal affected the ranking of problems but not the total of problems encountered within each major area. Those who had experience as principals had more problems per person than those without such experience.

Individual problems within the nine major areas were tallied for each group to see if there was a similarity in the problems most often checked. There was very little similarity.

Among the problems not dealt with in the literature, but encountered by supervisors, most fell into two categories of working with teachers and the work load of supervisors.

In regard to their own preparatory experience beginning supervisors were most concerned with in-service education programs and concerned secondly with the kind of help rendered. There was a professed desire for on-the-job help to assist in solving individual problems. Short but frequent workshops devoted to solutions of practical problems were generally favored.

Comments of the supervisors generally indicated a need in the educational preparation of supervisors for wider school curriculum knowledge, with emphasis upon methods, philosophy, and human dynamics, and a program of preparation culminating in some type of internship similar to the one presently in use for Florida teachers.

Microfilm $2.75; Xerox $9.45. 210 pages.

A SURVEY OF STUDENT PERSONNEL SERVICES IN SELECTED FLORIDA COMMUNITY JUNIOR COLLEGES AND THE ATTITUDES OF PRESIDENTS, STUDENT PERSONNEL OFFICERS, FACULTY MEMBERS AND STUDENTS TOWARD THESE SERVICES.

(Order No. 61-3638)

Kenneth Urial Gutsch, Ed.D.
The Florida State University, 1961

Specifically, this study sought to answer three major questions: (1) What is the extent of present student personnel services offered by certain selected community junior colleges in Florida? (2) What are the attitudes held by Florida's community junior college presidents and student personnel officers toward these services? (3) What are the attitudes held by faculty members and students regarding the over-all effectiveness of these services in a sampling of Florida community junior colleges selected for more intensive study?

The study was carried out in two sections referred to as Section I and Section II.

Section I was concerned with a survey of presently existing student personnel services in sixteen Florida community junior colleges selected for this study. An open-end Check List was submitted to presidents and student personnel officers in these institutions to determine what student personnel services were provided, the frequency with which they were provided, and what value was placed on these services.

Section II was concerned with the attitudes toward student personnel services as expressed by faculty members and students in a sampling of the community junior colleges used in Section I. Questionnaires were administered to faculty members and students in an effort to obtain this information.

An analysis of the data revealed that,

1. The most incompatible relationships in the area of administration and organization seem to be the contrast between the frequency and value placed on the in-service training of student personnel workers.
2. Records are maintained by all of the community junior colleges, but few of the record systems appear to contain adequate subjective information about the individual.
3. Although an attempt at research was reported by all participating institutions, research is an area in which many of the community junior colleges felt inadequate.
4. Admission policies appeared to be designed for guidance purposes, but students and faculty members felt

that more attention should be given to the testing program.

5. Generally, orientation begins when literature is sent to prospective students and visits are made to contributing high schools; prior to or at the beginning of each term, student handbooks, individual conferences, assembly programs, and social events are utilized for orientation purposes by a majority of the reporting institutions.

6. A change in registration appears to be necessary in some of the schools where faculty members and students have called for modifications which would bring about a simple step-by-step plan for registration.

7. Counselors tend to be generalists rather than specialists. The services offered are most adequate for transfer students and least adequate for terminal students, drop-outs, and individuals with personality conflicts.

As a result of this study, it appears that an over-all general awareness of the need for student personnel services as well as the nature of these services gives promise of better student personnel programs in the very near future. Microfilm $2.75; Xerox $7.80. 167 pages.

THE PARTICIPATION OF ARIZONA ELEMENTARY SCHOOL PRINCIPALS IN CERTAIN ASPECTS OF THE BUILDING READING PROGRAM IN GRADES ONE THROUGH SIX

(Order No. 61-4228)

Ronald Burton Jackson, Ed.D.
University of Arizona, 1961

Supervisor: Dr. Milo Blecha

THE PROBLEM

The purpose of this dissertation was to explore the participation of Arizona non-teaching elementary school principals in certain specific aspects of the building reading program. The participation of Arizona principals in the reading program was compared to that (1) found in the professional literature, (2) recommended by a nationally-selected jury of educators, (3) perceived by a systematic sample of their teachers.

The following were considered as secondary problems: (1) to what extent were the schools involved in the reading program functions on a building-wide basis without the participation of Arizona principals? (2) was the principals' academic preparation to participate in the reading program related to the extent of their involvement in the reading program? (3) to what extent do the jury and the literature agree on the participation of school principals in the reading program?

PROCEDURE

The elementary school principals were surveyed by questionnaire. The questionnaire was based upon recommendations found in the literature which clearly urged the participation of elementary principals in specific reading program functions. Sixty functions were found. These functions were formed into the following reading program categories: philosophical aspects, supervisory aspects, instructional aspects, library aspects, and administrative aspects.

A pre-test group was selected from neighboring states to aid in evaluating the questionnaire. The final questionnaire was termed an Inquiry Form.

The Inquiry Form was posted to all non-teaching (264) Arizona elementary school principals. This form was also posted to the nineteen educators who were asked to act as a jury in determining whether or not they concurred with the literature's recommendations concerning reading program participation by school principals. A briefer version of the same questionnaire was composed for posting to a systematic one-sixth sample of teachers who were employed under Arizona principals. These teachers were to furnish an independent estimate of their principals' reading program involvement.

A trip was made to the Department of Public Instruction, Phoenix, Arizona in order to determine, from official files, the academic preparation of principals to participate in the reading program.

CONCLUSIONS

The first hypothesis stated in this study involved a comparison of the principals' responses with the recommendations found in the literature concerning the participation of these school administrators in certain specific aspects of their building reading program. The hypothesis stated that a substantial difference would exist between the two. For the purposes of this study, a substantial difference was reasoned as existing when less than sixty per cent of the principals expressed themselves as participating in the item-described function. Substantial differences were found in the categories of supervision, instruction and the library. However, the hypothesis was not supported in the categories dealing with the philosophical and administrative aspects of the reading program.

The second hypothesis stated that the participation of Arizona elementary school principals in the reading program was substantially different from that participation recommended by a jury. A substantial difference was reasoned as existing between the two when a jury proportion of .750 or greater recommended the principals' participation in a particular function while the expressed participation by the principals was found to be less than sixty per cent. For only one category, that of supervision, was this hypothesis supported.

The third hypothesis stated that a difference between the participation responses given by Arizona elementary school principals and their teachers' perception of that participation would be found. This hypothesis was not supported.

The fourth hypothesis stated that the academic preparation of elementary school principals in Arizona is related to their extent of participation. This hypothesis was not supported.

When the participation of school and central office personnel in the building-wide reading program was studied, it was found that functions which the principals did not participate in were not, in a majority of cases, being performed by anyone else.

Finally, it was found that the jury agreed with the literature to a proportion of .750 or over in forty-five out of sixty items in the Inquiry Form. In only two specific items

was there actual disagreement by the jurists with the recommendations found in the literature.

Microfilm $2.75; Xerox $6.80. 142 pages.

AN ANALYSIS OF CRITICAL ADMINISTRATIVE EDUCATIONAL PROBLEMS IN THE COLUMBIA BASIN

(Order No. 61-3238)

Herman F. Jaeger, Ed.D.
Washington State University, 1961

Chairman: Zeno B. Katterle

The purpose of this study was to analyze basic school finance problems in the Columbia Basin Project area with special emphasis on the accuracy of school enrollment projections and their effect on the financial support program.

Data on school finance and school populations were secured from the following sources: the offices of the County Superintendents of Schools of Grant, Adams, and Franklin Counties; Annual Progress Reports on the Columbia Basin prepared by the State College of Washington for the Cooperating School Districts of the Columbia Basin area; the Office of the State Superintendent of Public Instruction; the State College of Washington; Washington State Census Board; the U. S. Department of the Interior, Bureau of Reclamation; the Puget Planners, Incorporated; and minutes of the Columbia Basin School Development Association for the period 1946 to 1957.

The method used in this study was to analyze population and school enrollment trends in the Columbia Basin Project; list projection techniques used in the Basin; ascertain deviations between projections and school enrollment; show the effect of difference between actual attendance and total enrollment and to determine the effect of these factors on the support program; determine the relationship between school enrollment projections and pupil-teacher ratio; ascertain the effects of over-estimating; determine the effect of growth rate on the financial support program; establish the relationship between assessed valuations and October 1 enrollments; and to develop a history of state and federal legislation and regulations for compensating excess-growth districts.

The three techniques used in this study to project the rate of school population growth in the Columbia Basin Project area are as follows: (1) Cohort-Survival, or Grade Succession, as applied by the Washington State Census Board; (2) the formula developed by the State College of Washington, School of Education, through the Cooperative Program in Educational Administration; and (3) Simple Moveup in grade level.

The analysis of basic school finance problems in the Columbia Basin Project area was based on the assumptions that there was excess growth in the school districts, that this growth affected the General Fund budgets, and that enrollment projections played an important role in determining the estimates of revenue for budget purposes.

This study indicates that school enrollments in the Columbia Basin Project almost tripled in seven years while assessed valuation per child decreased to a point approximately $600 below the average for the State of Washington. Enrollment projections were accurate for school districts where the factors remained constant, and less accurate when outside influence affected any of the primary factors or assumptions. Projection techniques used in the Columbia Basin school districts must be refined for greater accuracy; new factors must be isolated, analyzed, and applied to projections. School administrators in the Columbia Basin should make conservative General Fund budget estimates as the anticipated revenues available vary greatly when different projections are used. Inaccurate estimates have encouraged the employment of excess teachers and excessive expenditures in some districts in the Columbia Basin Project area. There is considerable evidence that an excessive rate of growth depletes the revenues available for budgeting purposes. The State and Federal governments have been generous in providing additional money for excess growth school districts.

The results of this study point up to the fact that there is still a great need for improvement in existing enrollment projection techniques and for establishing new techniques that will tend to make use of all available factors.

Microfilm $3.30; Xerox $11.50. 253 pages.

AN ANALYSIS OF THE RELATIONSHIP OF ACCREDITATION, FINANCE, AND SIZE OF NEBRASKA HIGH SCHOOLS TO SCHOLASTIC ACHIEVEMENT.

(Order No. 61-3850)

Ralph Dale Jantze, Ed.D.
The University of Nebraska Teachers College, 1961

Advisers: William L. Pharis, Ed.D., and
Dale K. Hayes, Ed.D.

Statement of the Problem. The purpose of this investigation was to determine whether there are differences in scholastic achievement in the basic school subjects of Nebraska high school students (1) in the various accreditation classifications of schools as set by the Nebraska Department of Education, (2) in schools of various expenditure levels, and (3) in various sizes of secondary schools.

Methods and Procedures. Scores from a single, standardized achievement test battery, the Iowa Tests of Educational Development (ITED), were used as the criterion. Differences in native ability of students were controlled by the results of the aptitude tests which they had taken in their respective schools.

A sample of forty-six secondary schools in the state of Nebraska which administered the Iowa Tests of Educational Development was used.

Categories were established in each of the areas of investigation, as follows:

Accreditation (Nebraska Department of Education)

Group I	AA - superior accredited
II	A - accredited
III	M - minor accredited
IV	N - non-accredited

Finance
(Total Current Expenses based on Average Daily Membership)

Group I	$651-800 Per-Pupil Cost
II	501-650
III	351-500
IV	201-350

Size (Enrollment)

Group I	above 800 students
II	400-799
III	200-399
IV	100-199
V	below 99

Achievement test scores were tabulated for the established groups, and the analysis of covariance was applied to the data to control for differences in aptitude and to determine the significance of the differences in achievement among groups, if any.

Summary of Findings. The following tables show the results of the analyses of the data. Table I shows that highly significant differences among groups were found in all three areas of study.

TABLE I

SIGNIFICANCE OF DIFFERENCES IN ACHIEVEMENT

Area	Degrees of Freedom	Level of Significance 1%	Level of Significance 5%	F-Value
Accreditation	3, 2212	3.78	2.60	15.89
Finance	3, 2212	3.78	2.60	10.78
Size	4, 2211	3.32	2.37	15.71

Table II shows the mean achievement scores for the groups of schools in each area of study after adjusting for differences in aptitude of students.

TABLE II

ADJUSTED ITED MEAN SCORES

Group	Accreditation	Finance	Size
I	18.6	19.2	17.9
II	18.4	18.1	19.2
III	16.2	18.4	18.5
IV	15.9	18.2	18.1
V	--	--	17.5

Conclusions. The conclusions based upon evidence collected for this study may be stated as follows:

1. Scholastic achievement in the basic school subjects is significantly greater in the two higher accreditation classifications than in the two lower accreditation classifications.

2. Scholastic achievement in the basic school subjects is greatest when per-pupil expenditures are the greatest, except in some cases where small enrollment results in higher per-pupil costs.

3. Scholastic achievement in the basic school subjects, within the limits of the sample, increases as enrollment increases, up to a point, somewhere between an enrollment of 400-799, and then decreases.

Microfilm $2.75; Xerox $4.20. 79 pages.

TESTING AND EVALUATION PRACTICES IN NEW ENGLAND PUBLIC SCHOOLS

(Order No. 61-3357)

Winston B. Keck, Ed.D.
Boston University School of Education, 1961

The Problem

This study is concerned with the status of testing and evaluation practices in the New England public schools, kindergarten through grade twelve. It analyzes and compares practices of school systems of different enrollment categories in the following aspects of the pupil appraisal program: (1) organizing and administering the program, (2) tests and other evaluation devices used in the program, (3) organizing and reporting test results, and (4) administrative and supervisory uses made of test results.

Method

A preliminary inquiry form, divided into four major categories, was developed and submitted to a jury of educators for validation. It was further refined by means of a pilot study. The final inquiry form, consisting of 43 items, was sent to every single school district community (not a member of a supervisory union or regional organization) and to a representative community chosen at random from each supervisory union or regional school district in New England. Six hundred twenty-seven school systems were selected to participate in the study. Complete returns were received from 62.9 per cent of the total sample.

The inquiry form was filled in twice by a selected number of respondents, and a personal follow-up was made of another selected sample of respondents in order to determine the reliability of the instrument.

Returns were transcribed on I.B.M. tabulating cards to facilitate statistical analysis. All data were converted to percentages and reported in tabular form for analysis and interpretation according to the following enrollment categories: (1) less than 500 pupils, (2) 500 - 999 pupils, (3) 1000 - 2999 pupils, (4) 3000 - 4999 pupils, (5) 5000 - 9999 pupils, (6) more than 10,000 pupils, and (7) the total New England sample.

Findings

Major findings of the study are:

1. Wide diversity of practices exist in the schools.
2. The median expenditure for the pupil appraisal program is forty cents per pupil per year.
3. The larger school systems provide a more comprehensive appraisal program than the smaller school systems.

4. The general school administrator is responsible for directing the major phases of the program.
5. The major problem or weakness of the majority of programs centers around test utilization and staff limitations.
6. Group intelligence tests and standardized achievement tests form the hard core of the program, both measures being administered on a systematic basis at regular intervals throughout the school systems.
7. Tests of special aptitude, interest, and personality are available for special purposes, but are not used extensively on a systematic basis in the schools.
8. Group intelligence tests are usually administered at grades 1, 3, and 6 or 7. The majority of school systems use individual intelligence tests to retest and check questionable cases.
9. A wide variety of patterns pertaining to grade level of usage of standardized achievement tests is noted. The greatest level of concentration is at grades 6, 8, 4, and 3, in the order named.
10. There is much greater use of standardized achievement measures at the elementary level than at the secondary level.
11. Non-test techniques find limited use in the schools.
12. The majority of schools regularly circulate test results to school functionaries, but only limited numbers of schools make such results available to parents and pupils.
13. Many and varied uses are made of test results.
14. Pupil identification, grouping and placement, curriculum planning and evaluation, and improving the instructional program represent the major administrative and supervisory uses being made of intelligence and standardized achievement tests.
15. Results of special aptitude tests, interest inventories, and personality measures find primary usage for individual pupil guidance.

Conclusions

General conclusions resulting from the study are:

1. Schools must exert a greater effort in providing funds for testing and evaluation if the program is to meet the needs of a modern education.
2. Additional well-trained personnel, given adequate time, is needed to provide the necessary direction to the program.
3. Schools should direct added emphasis to the education of the teacher in test administration, interpretation, and utilization, as well as in newer evaluation techniques.
4. The schools as a group seem to be meeting minimal standards in the measurement of basic skills and informational areas in the elementary grades, with reading and arithmetic receiving the greatest emphasis. They appear to fall far short of a minimal program at the secondary level, both in the broad field areas and in separate subject measurement.
5. The traditional test approach dominates the scene, with emphasis upon the three R's and subject content areas. Newer techniques for the most part are neglected.
6. The greatest need for improvement in the present program might be found in the area of personal-social development. Very little is being done to evaluate social attitudes, emotional adjustment, social adjustment, and related needs of the learner.
7. Data imply that standardized achievement tests are used more extensively for administrative and survey purposes than for instructional and classroom purposes.
8. The schools, as a whole, do an adequate job in circulating and making test results available to school functionaries, but fall far short in making results available to parents and pupils.
9. The primary use of test results is for purposes of guidance and aiding the maximum school adjustment of the pupil. Limited utilization is noted for improving the more broad aspects of the educational program.

Microfilm $5.55; Xerox $19.80. 436 pages.

CHARACTERISTICS OF MOST AND LEAST EFFECTIVE INTERNATIONAL COOPERATION ADMINISTRATION EDUCATORS SERVING OVERSEAS

(Order No. 61-3218)

Noel Thomas Myers, Ed.D.
Indiana University, 1961

Chairman: Dr. Maurice E. Stapley

For several years the United States Government, in its cooperative program with developing countries, has been using the services of American educators abroad. The Government has employed American educators who have been considered successful in their positions and sent them abroad to serve in an international program operating in nearly 60 countries.

These educators carry out a wide range of responsibilities in a comprehensive education program. In addition to adjustments to varied responsibility, technicians have to adapt to strange cultural and living conditions for themselves and for their families. To enter foreign service means separation from relatives and breaking of community and professional ties.

Recruitment problems are numerous. It is difficult to identify and to procure the services of successful professional people who may also be successful abroad. It is extremely important to be able to identify success characteristics as a basis for improved recruiting procedures, for in-service training programs, and for retention of highly successful personnel.

The main purpose of this study was to determine whether or not significant differences exist between most and least successful education advisors in established categories of recurring characteristics of critical importance.

To accomplish this purpose the study endeavored to (1) obtain data pertaining to characteristics which, in a significant number of instances, are found to cause success or failure in the professional services of American educators serving overseas in the ICA program; (2) to categorize these data into logically coherent types of important characteristics; and (3) to compare the relationships between successful and unsuccessful personnel as reflected by data in types and characteristics.

Procedure

In this study an entire population was considered. This population consisted of approximately 127 American educators serving in the International Cooperation Administration overseas program.

Field ratings and supplementary ratings by field supervisors provided data. Composite scoring of three consecutive yearly evaluations by peers were used to identify most and least successful educators. The detailed analysis of evaluations of highest and lowest rated cases provided extremes of behavior. It was thus possible to determine characteristics of importance which contribute to success or failure.

Findings

1. Personal characteristics are of paramount importance in determining success or failure.
2. No one factor of technical competence decides success or failure. ICA education technicians have ample technical background.
3. Highly specialized personnel cause major difficulties in placement and retention.
4. Five years of teaching prior to foreign service is ample for the technician to have gained knowledge and techniques that can be adapted to the host country.
5. Advanced degrees in education do not determine success or failure for the American technician.
6. The greatest number of successful technicians is found in the age range of 35 to 46.
7. Wives of technicians influence success or failure of the husband.
8. Facility in languages is not a success or failure determinent.

Conclusions

1. Personal characteristics of both technician and wife are more critical than other factors in determining success of the technician.
2. Higher degrees and facility in languages are helpful to the technician only when desirable personal characteristics are also present.
3. Seniority in age and long tenure in American school teaching are not basic essentials for success of ICA educators.
4. Highly specialized personnel should be employed only as limited term consultants.
5. Appropriate findings in this study should be incorporated in the processes of selection and orientation of new education employees.
6. Training for supervisory personnel in rating procedure should be conducted consistently and regularly.
7. Effective evaluation is a continuous process and should serve as the basis for in-service training of individual technicians.
8. Professional terminology in reference to personal qualifications and to job descriptions should be clarified and standardized.

Microfilm $2.75; Xerox $8.00. 175 pages.

AN EVALUATION OF THE COOPERATIVE PROGRAM FOR INSTRUCTIONAL IMPROVEMENT

(Order No. 61-3003)

Ray Cook Phillips, Ed.D.
Auburn University, 1961

Supervisor: Truman M. Pierce

This study was concerned with an appraisal of an experimental program in instructional improvement conducted in cooperation with twenty-five Alabama school systems, the School of Education, Auburn University, and the Fund for the Advancement of Education, Ford Foundation. Five steps were conducted to achieve this purpose:

1. The theoretical foundations, hypotheses, and purposes of the Cooperative Program for Instructional Improvement were identified.
2. Criteria based on the hypotheses and purposes of the Program were formulated which served as the basis for the evaluation of the Cooperative Program for Instructional Improvement.
3. The Cooperative Program for Instructional Improvement was described and analyzed in relation to the purposes and hypotheses of the Program.
4. The Cooperative Program for Instructional Improvement was evaluated on the basis of the criteria formulated in Step Two.
5. Recommendations were made on the basis of conclusions drawn from the findings of the study.

Data for the appraisal were obtained from four sources: (1) publications and studies developed during the first four years of the Program, (2) participants' permanent records on file in the School of Education, (3) interviews conducted with participants in the Program, and (4) observations based on the investigator's participation in the Program.

The more significant conclusions of the study were:

1. The Cooperative Program for Instructional Improvement was a successful experiment in achieving instructional improvement in the participating schools and school systems and assisting teachers and administrators to improve their professional competency through: (a) establishing a cooperative working relationship between the School of Education and the public schools involved in the Program, (b) increasing competence in the use of the scientific method of problem-solving, (c) utilizing the local school as the basic action agency for school

improvement, (d) establishing cooperative working relationships between school personnel and lay people, (e) releasing the leadership abilities of participants in the Program, (f) identifying mutually acceptable goals, (g) increasing involvement in instructional improvement programs, (h) relating graduate work to the purposes of teachers and administrators and to instructional improvement in the participating schools and school systems, (i) assisting participants in assuming responsibility for their own learning, (j) providing a learning climate relatively free from undue and inhibiting threat, and (k) through enabling Auburn University to make its resources available and work cooperatively with local schools toward the achievement of local objectives.

2. The Cooperative Program for Instructional Improvement enabled teachers, school administrators, doctoral students, and staff members involved in the Program to (a) improve their professional competence, (b) work cooperatively in field situations in the solution of important educational problems, (c) gain a greater awareness and concern for instructional improvement, (d) relate theory to practice, (e) keep abreast of current problems in education throughout the State, and (f) increase their effectiveness in their work.
3. The Cooperative Program for Instructional Improvement assisted schools and school systems in planning, organizing, and conducting effective programs of instructional improvement.
4. The Cooperative Program for Instructional Improvement enabled the School of Education to fulfill more adequately its responsibilities to the State and region.
5. The Cooperative Program for Instructional Improvement provided the organization, framework, and personnel for more extensive and effective use of Educational Television as a mass media of communication.
6. The Cooperative Program for Instructional Improvement provided additional professional training for teachers and administrators who otherwise would not have had an opportunity to attend college and participate in other activities designed to contribute to their professional growth.

The more significant recommendations were:

1. The Cooperative Program for Instructional Improvement, including the various activities of the Program, should be continued and expanded to include additional schools and school systems in the State and region.
2. Professional courses, in addition to the four foundation courses, and courses in the academic disciplines, should be offered which are appropriate to meet the needs of teachers and administrators in the schools and school systems in the Cooperative Program for Instructional Improvement.
3. A study should be made of staff time and teaching load in an effort to permit staff members to more adequately meet the demand for field services in the State and region.
4. Colleges, universities, the State Department of Education, and other agencies in the State and region concerned with instructional improvement, should engage in intensive study and cooperative effort to adjust rules, regulations, and responsibilities concerning selection, admission, certification, transfer of credit, and functions to more adequately meet the needs of teachers and administrators in the State and region.
5. Research studies should be conducted to determine the influence of the various activities of the Cooperative Program for Instructional Improvement on producing desirable changes in students.
6. More time should be devoted in the Cooperative Program for Instructional Improvement to in-service and career development of staff members through (a) continuous evaluation, (b) sharing of ideas and findings, and (c) participating in cooperative research related to the purposes of the Program.
7. The assignment of responsibilities to staff members in the various activities of Cooperative Program for Instructional Improvement should be made more commensurate with the staff members' interests, preferences, competencies, areas of specialization, and with their other responsibilities.
8. Study should be devoted to determining ways and means of providing activities of a non-credit nature, such as short courses and workshops, designed to assist schools and school systems solve specific problems encountered in their instructional improvement programs.

Microfilm $3.50; Xerox $12.40. 271 pages.

TEACHER LOAD IN NEBRASKA CITIES BETWEEN 1,000 AND 5,000 POPULATION

(Order No. 61-3853)

Bill Henry Schulte, Ed.D.
The University of Nebraska Teachers College, 1961

Adviser: Leslie L. Chisholm, Ph.D.

The Problem

The purpose of this study is to determine the teacher load of Nebraska public high school teachers in communities between 1,000 and 5,000 total population. Specifically, the study included 94 Nebraska public high schools. There are approximately 1,098 full-time teachers in these schools.

Only full-time public school classroom teachers were included in this study. The administrative and supervisory personnel who teach less than one-half day and the non-teaching personnel were excluded.

Teacher load encompasses all official responsibilities of teachers, including classroom duties and other assignments.

The Procedure

The procedure followed in the study is divided into four major parts. Parts one and two deal with a survey of the literature pertinent to the area of measurement of teacher load. They involve the determination of the most valid formula for measuring teacher load.

Part three consists of the steps used in obtaining data from responses to questionnaires sent to teachers in the 94 schools. The questionnaire requests information necessary for computing the teacher load by the Douglass formula; general information and attitudes concerning the participating group; material that indicated teachers' attitudes and opinions toward teaching assignments; and recommendations by cooperating teachers for improving the teacher load situation.

Part four consists of tabulations of the data, computation of individual teacher loads, and analyzing the data.

Sixty-six per cent of the 1,098 full-time teachers in the 94 schools participated. Teachers in eleven different subject areas were represented.

Summary and Conclusions

The review of literature relative to the study revealed the following: (1) Many attempts have been made since 1922 to devise an objective formula for measuring teacher load, (2) the Douglass formula, which encompasses all of the factors of teacher load as stated in Regulation 10 of the North Central Association of Colleges and Secondary Schools, is commonly accepted as the most objective and comprehensive formula for measuring teacher load, the selection of the Douglass formula for this study being further substantiated by the fact that it had been used successfully by national groups and in many research studies and, (3) teacher load should be defined to include all official responsibilities of teachers.

An analysis of the data reveals the following findings:

1. Variations in the teacher load are apparent both when comparing the subject-matter areas and individual schools.
2. The range of teacher load for all teachers was from 17.95 to 52.22 Douglass units.
3. The teacher load indices for the participating schools for the first quartile, median, and third quartile, although above the national norms in each instance, compared quite closely with national norms, the median teacher load for the participating teachers being 31.15, while the national median was 29.9 Douglass units, the first quartile for Nebraska teachers 27.19 units, while the national norm 27.3; and the third quartile for Nebraska teachers 34.82 units, while the national norm was 32.9 units.

The major recommendations of the study are:

1. Facts should be available in each school, in a form that makes analysis possible of each teacher's total load.
2. While there is a need for some reduction in the median load for Nebraska teachers, the more urgent need is the equalization of teacher loads; immediate steps should be taken to equalize teacher loads for the welfare of teachers and the effectiveness of the school program.

Microfilm $3.05; Xerox $10.80. 236 pages.

RELATIONSHIPS OF CERTAIN BUSINESS MANAGEMENT PRACTICES TO QUALITY OF EDUCATION AS INDICATED BY PUPIL ACHIEVEMENT AND ADMINISTRATIVE VARIABLES IN SELECTED SCHOOLS

(Order No. 61-3021)

Jacob Harrel See, Ph.D.
Ohio University, 1961

Director. Samuel I. Hicks

This study attempts to answer two questions: (1) What are the statistical relationships between the incidence of certain business management practices and each of two criteria used to indicate the quality of education? (2) What are the statistical relationships between the two criteria used to indicate the quality of education?

The school systems studied included thirteen city, county, and exempted village districts in Ohio and West Virginia. Enrollments in the districts ranged from 835 to 8,052.

The twelve business management practices used in the investigation were selected from business management practices recommended in textbooks in the area of business administration of schools.

One criterion used to indicate the quality of education consisted of the following seven administrative variables: (1) the numerical adequacy of the professional instructional staff; (2) the numerical adequacy of the professional staff of specialists; (3) the per cent of the staff holding baccalaureate degrees; (4) the per cent of the staff holding master's degrees; (5) the per pupil expenditure for all current operating expenses; (6) the per pupil expenditure for professional staff salaries; and (7) the per pupil small-item expenditure.

The second criterion used to indicate the quality of education was the relative excellence of pupil achievement in basic skills at the sixth grade level. The subjects were all of the 2,014 pupils enrolled in grade six within the thirteen systems studied. Data consisted of composite raw scores on the California Short-Form Test of Mental Maturity (Elementary, 1957 S-Form) and composite raw scores on the Stanford Achievement Test (Intermediate Battery, Partial, Form-L).

A product-moment coefficient of correlation between the composite raw scores on the aptitude test and on the achievement test administered to the 2,014 pupils was .814. It was statistically significant at the .01 level. A regression equation covering the measurements on the 2,014 pupils was determined and achievement values were predicted for each of the pupils of each system on the basis of pupil aptitude scores. An excellence in achievement score for each school district was calculated by dividing the total of the differences between actual achievement scores and predicted achievement values for the pupils of each district by the number of pupils involved.

The frequencies of the twelve business practices found to be present in the thirteen systems were tabulated. Incidence of the twelve practices was correlated to both criteria used to indicate the quality of education. Appropriate point-biserial r's and product-moment r's were determined.

Product-moment r's were computed which expressed the relationships between the two criteria employed to indicate the quality of education.

Within the school systems studied, the relationships between the twelve business management practices and the quality of education indicated by either the sixth grade pupil achievement or the seven administrative variables are not statistically significant at the .01 level.

All of the r's expressing the relationships between the two criteria employed to indicate the quality of education --between the excellence in pupil achievement and the seven administrative variables--are negative. None are statistically significant at the .01 level. The evidence suggests that the school systems less favored by adequacy of financial resources and by adequacy of professional staffs are placing comparatively great emphasis on basic skills. Microfilm $2.75; Xerox $7.00. 150 pages.

AN EVALUATION OF THE INTERMEDIATE UNIT OF PUBLIC SCHOOL ADMINISTRATION IN MINNESOTA WITH A PLAN OF REORGANIZATION

(Order No. 61-4176)

Frank Henry Smith, Ph.D.
University of Minnesota, 1961

Adviser: Dr. Otto E. Domian

The purpose of this study was to evaluate Minnesota's intermediate unit, commonly known as the county superintendency. The origin, structure, and function of this unit were examined to gain a concept of its development and its current status. Since the office was made elective in 1876 no professional qualifications have been attached to it and are not required today for incumbent superintendents. The salaries of the superintendents have been too low to encourage much professional training. Also the large number of rural schools per county in the past must have necessitated only perfunctory attention to individual schools on the part of the superintendent.

There has been a major change in the functions of the county superintendency due to the transfer of districts, pupils, and teachers from the administrative control of the county superintendents to the superintendents in the independent districts. It was found that since 1926-27 the number of common districts in the state had decreased from 7,344 to 2,607; the number of teachers in rural schools from 9,316 to 2,337; and the number of pupils in such schools from 202,566 to 43,748.

Literature dealing with the intermediate unit was studied along with survey reports made by individuals and research groups. From the recommendations found in these studies a set of criteria was developed with which to evaluate this office. The criteria specified that an effective intermediate unit should provide leadership and services to local schools; should permit all districts to share in the service programs; encompass a logical combination of six to fifteen whole and defensible school districts; contain a minimum of 10,000 public school pupils; be governed by an elected board of education with authority to appoint a qualified superintendent and qualified staff; be fiscally independent; and be flexible in structure.

Application of these criteria to the existing intermediate unit showed that: the county superintendents are handicapped by a meager background of educational and professional training; the superintendent's office is poorly staffed and can thus offer no professional educational services to the schools; the superintendent performs only nominal reporting functions for the independent districts; the great majority of the counties do not contain enough pupils or a proper number of defensible school districts to constitute the bases for satisfactory intermediate units; there are no county boards of education to formulate policies or assist the superintendent in providing service programs; the intermediate unit is not fiscally independent; and only a certain amount of flexibility exists with respect to the extension of school districts across county boundaries.

Many of the deficiencies of the existing intermediate units as revealed by the application of the criteria could be remedied by legislation but this would still not provide enough pupils or a proper number of adequately organized districts to make it a satisfactory basis for maintaining an efficient unit.

Using the criteria as standards a pilot plan for replacing the existing county superintendency with an area-based intermediate unit was developed. This plan proposes the formation of thirty units and presents the pupil enrollments, the number of districts, and the assessed valuations for each.

This pilot plan shows the feasibility of such an organization for the state. Before attempting to establish a system of intermediate units, it is recommended that a thorough professional study of all pertinent factors such as enrollment, school offerings, educational needs, financial background, geographical features, and socio-economic conditions should be made.

Microfilm $6.80; Xerox $24.30. 536 pages.

PRINCIPLES AND TECHNIQUES FOR THE SELECTION OF OUTSTANDING TEACHERS

(Order No. 61-3856)

Lloyd Clair Texley, Ed.D.
The University of Nebraska Teachers College, 1961

Advisers: Professor Frank Ernest Henzlik and
Professor Merle Arden Stoneman

Statement of the Problem

The problem of this study was to reveal and identify unusual and constructive principles and practices for the selection of competent, professional teachers by drawing on the existing realistic elements and practices reported by experienced public-school administrators.

Methods and Procedures

The steps in the development of this study were as follows:

1. Review the educational literature.
2. Select the administrators who would be invited to participate in the study.
3. Construct and mail the "Letter of Inquiry" to the selected administrators.
4. Classify and organize the data submitted in response to the inquiry.
5. Analyze and synthesize the data collected for the principles and techniques underlying present practices for the selection of highly competent teachers.
6. Compare, contrast and assemble the principles and practices submitted to outline a design or approach for the selection of high-caliber teachers.

Summary of the Study

Administrators should be active in the search for outstanding teachers to serve as replacements and as added staff members. This search should be placed on a continuing, long-range basis and should be participated in by all interested, presently employed staff members. The techniques and procedures of discovering highly competent teachers should be as extensive and varied as possible without overlooking the ethics of the profession.

Prospective candidates must then be selectively encouraged to apply for a position. Printed materials and present, enthusiastic employees may be utilized for encouraging highly qualified candidates to apply. A personal interest in individual candidates with respect to their possible employment possibilities is essential on the part of the electing administrator.

When an application has been made, informative data should be collected according to established guide lines developed for the particular school. These data must be collected in such a way as to be complete and reliable as possible in order that as accurate an appraisal as possible may be made of the applicant.

A great deal of attention must be given to the qualities desired in staff members in order that appointment selections and later evaluations of service are made on the same basis. Devices purported to predict teaching success are not widely reported to be used. They should, however, be recognized for the contributions they may be able to make in the future.

The final evaluation of applicants should be based upon the informed judgment of as many persons as possible. Evaluative procedures are most useful when built up of the practices and procedures proven useful in a particular setting. Microfilm $3.40; Xerox $11.95. 264 pages.

ORIENTATION OF NEW FACULTY MEMBERS IN NORTH CENTRAL COLLEGES AND UNIVERSITIES

(Order No. 61-3684)

Rev. Norbert John Tracy, S.J., Ph.D.
University of Minnesota, 1961

Co-advisers: Ruth E. Eckert
Horace T. Morse

Problem

College and university administrators are becoming increasingly aware of the need to help new faculty understand institutional purposes, policies, and their own institutional roles. Many also recognize that inexperienced teachers, recruited in ever-growing numbers, need systematic help with teaching and related professional services. Yet little is known about the effectiveness of orientation practices.

Purposes of Present Study

This study was designed in order (1) to learn about orientation practices, (2) to secure administrative and faculty appraisals of practices, and (3) to test hypotheses about orientation in institutions classified by size, type of control, and management of faculty orientation, and hypotheses about appraisals made of practices by different classes of respondents.

Procedure

Based on a review of the literature and discussions, four study instruments were developed, tried out in a pilot study, and refined. Data were gathered in two phases.

First, in a four-page questionnaire, deans of 336 of the 345 accredited, four-year liberal arts programs in North Central institutions (97 per cent of those contacted), identified and appraised orientation practices in their institutions. A stratified random sample of twelve colleges was then selected from among institutions maintaining a minimum program of faculty orientation, and four Jesuit colleges with similar characteristics were added.

Interviews were held with 231 faculty in these 16 institutions, using three special forms for new faculty, experienced teachers, and department chairmen, who were selected by random sampling as far as possible. The interviews sought validation of questionnaire findings and further insights into problems and procedures of faculty orientation.

All data were coded, then analyzed by IBM machine tabulations. Ten kinds of hypotheses were tested. Statistical procedures included the "t" test, chi-square, and the Kruskal-Wallis one-way analysis of variance by ranks. Analyzed data are presented in forty tables. The bibliography includes 234 items and an appendix contains sample questionnaire forms.

Findings

1. Practically all institutions studied provide some faculty orientation, with about half of the procedures established during postwar expansion.

2. Deans in ninty per cent of the institutions reported these practices: A campus visit for interviews, housing assistance, social affairs, and an "open door" for conferences. Eight of nine other practices were identified in thirty to ninety per cent of the colleges.
3. A faculty committee assists in orienting new faculty in almost a third of the colleges studied. Greater percentages of deans with such assistance reported orientation practices and appraised them more favorably than did deans lacking such a committee.
4. Institutional size and control seem to affect the use of relatively few orientation procedures.
5. Interview reports corroborated earlier questionnaire findings about kinds of practices, but new faculty appraised these less favorably than all other respondents (significantly so in some instances), explaining in free comments that many practices need improvement.
6. Beginning teachers and experienced newcomers agreed closely on institutional information desired early in employment and on appraisals of practices, and named special meetings for newcomers, contacts with experienced teachers, and individual conferences with the department chairman as the most helpful sources of information.

Conclusions

1. Although many institutions provide numerous helps to new faculty, only a few well-defined orientation programs seem to exist.
2. Faculty committees can effectively assist in planning, carrying out, and evaluating an orientation program for new faculty members.
3. Most new faculty members want carefully planned orientation to institutional goals and policies. They need assistance more pertinent to their special needs, and feel that present programs can be improved considerably along these lines.

Microfilm $4.70; Xerox $16.45. 365 pages.

A COMPARISON OF TEACHER AND NON-TEACHER GRADUATES OF LAMBUTH COLLEGE

(Order No. 61-3191)

Henry Adolphus Williams, Jr., Ed.D.
University of Arkansas, 1961

Major Professor: Dr. Roy B. Allen

I. THE PROBLEM

The purpose of this study was to determine if there is a significant difference between those students who prepared for teaching as a vocation and those students who did not, on college aptitude, scholarship, and education and occupation of the father.

II. THE PROCEDURES

The sample was composed of graduates of Lambuth College for the years 1956, 1957, 1958, 1959 and 1960, subject to two limitations: (1) the graduate had attended Lambuth College for the entirety of their collegiate career, and (2) the graduate had completed his program of study in eight successive semesters, not including summer transfer work.

Graduates were separated as to whether or not they had prepared for teaching as a vocation so that they could be compared. The data were secured from academic records and personal data sheets which are maintained for each student in the administrative offices.

The t-test was used to determine if the homogeneity of the two groups as to pre-college aptitude, past academic performance, and the social characteristics were significant. It was also applied to determine the significance of the interrelationships of pre-college aptitude, past academic performance, social characteristics, and academic achievement in college. A correlational comparison on academic achievement was accomplished by treating the successive grade-point averages of each semester as eight separate variables.

III. FINDINGS

1. The non-teacher group had a higher indicated mean on the majority of the variables. Among the factors tested, only the sex factor revealed a significant difference between the two groups.
2. As a result of the large number of low and negative correlations, the relationship between the social characteristics and academic success of the two groups did not show a significance.
3. The first semester grade-point correlated in a declining manner with successive grade-point averages for each group. Also, there were instances of such a correlation between other grade-point averages and remaining ones. Grade-point averages of the junior year predicted senior grade-point averages consistently better than high school percentile rank and American Council on Education Psychological Examination scores.
4. With regard to the intercorrelations of the social factors, the father's educational level was seen to be highly correlated with the father's occupational level for both groups. For the teacher group, the father's educational level varied in relationship with the father's occupation, size of home town and distance of home town from the college. For the non-teacher group, a similar correlation was seen between these same factors. Of the teacher group, the father's occupational level was definitely related to the distance of the home town from the college. While some relationship did exist between these two factors for the non-teacher group, it was lower.

IV. RECOMMENDATIONS

On the basis of the findings of this study, the following studies seem to be indicated:

1. A study of the relationship of other social factors to various aspects of academic achievement.
2. A similar study of the factors used in the present study, utilizing different means of quantifying the raw data.
3. A study of the relationship of the first semester grade-point average to remaining semester grade-point

averages, assigning weights to required and elective courses selected by the student in each semester.

4. A study, conducted in a publicly-supported institution, utilizing the same variables and controls as the present study.

Microfilm $2.75; Xerox $6.00. 123 pages.

EDUCATION, ADULT

A PILOT STUDY TO DESIGN A METHODOLOGY FOR DETERMINING COMMUNITY SERVICES IN THE SMALL CHURCH-RELATED JUNIOR COLLEGE

(Order No. 61-3636)

Dorcas D. Gambill, Ed.D.
The Florida State University, 1961

Statistics indicate that, although junior college enrollments are increasing annually, the number of church-related junior colleges is remaining static. There is simultaneously a steady increase in the number of community colleges. It therefore becomes imperative that church-related institutions examine their services to the areas in which they are located. This study, then, attempted to design and actually test a methodology for determining community services in the small church-related junior college. The pilot college was a century-old Methodist institution located in a sparsely settled area of Georgia. The decade studied was 1950-1960.

The first step in the study was to become familiar with the demography and ecology of the area through a study of population characteristics from the census reports. It was important also to scan the historical background of the area and of the pilot institution. Other problems were:

1. To select and adapt methods for studying local participation in the services offered by the college in terms of the general-educational function, the college-preparatory function, the terminal-vocational function, the function of adult education, and the special services to the area in fulfillment of the expectations of the sponsoring body.
2. To define the boundaries of the college service area.
3. To select and adapt methods for determining the educational needs and interests of the college community as potential services.
4. To present a detailed description of each method utilized in the pilot study.
5. To evaluate the relative effectiveness of the various surveys including, for practicality, tabulations of the cost and man hours expended for each.
6. To evaluate the design in toto as a means of determining community services in the small church-related junior college.

In this study the survey was the principal method utilized. Specific research techniques were:

1. A house-to-house survey of the white residents in the city of Cuthbert by means of an interview schedule.
2. A survey of data tabulated from the day-student schedule cards from 1956-1960.
3. A survey utilizing a modification of the Galpin technique for defining the service boundaries of the college community.
4. A survey of attendants at college programs conducted by means of a register-of-attendance card.
5. A questionnaire mailed to a sampling of ex-students from the area.
6. A survey comparing the grades of a random sampling of ex-students who had continued their education at four-year institutions with the grades received at the two-year college.
7. An industrial survey of nine business corporations within the area by means of an interview schedule.

It was evident from the study that this design will enable the small church-related junior college to objectively examine its present community services and to determine potential community services for its area.

Microfilm $2.75; Xerox $7.00. 150 pages.

THE INFLUENCE OF CERTAIN FACTORS ON ATTENDANCE IN PUBLIC SCHOOL ADULT EDUCATION PROGRAMS

(Order No. 61-3644)

Jack W. Pattyson, Ed.D.
The Florida State University, 1961

The Problem. The major problem in this investigation was to test certain administrative controllable factors to see if they exercise any influence on attendance in public school adult education courses. More specifically, the investigation sought to test the relationship of the following factors to attendance: (1) to test statistically whether or not there is any relationship between certain classifications of courses held on certain days of the week and attendance; (2) to test statistically if there is any difference in attendance between certain combinations of course classifications; (3) to test statistically if there is any difference in attendance on certain specific days of the week; (4) to test statistically if there is any difference in attendance in courses having 3-9 meetings, 10 meetings, 11 meetings, and 12-15 meetings; (5) to test statistically if there is any difference in attendance in certain classifications of courses having certain specific numbers of class sessions.

Method of Investigation and Source of Data. The method of procedure of this investigation was analytical. The two school systems used in this investigation were of middle class suburban New York communities. The communities were Baldwin and Hempstead on Long Island. The public school adult education courses investigated in this study are representative of twelve broad classifications of courses reported annually to the Bureau of Adult Education, State Education Department, Albany, New York. The data were secured from the official permanent records for the 1955-1956 and the 1956-1957 school years. The study included 380 courses covering the two year period. There were 6,115 adults registered, with an aggregate attendance of

49,459. Courses selected for study in this investigation ranged in number of class sessions per term from three to fifteen. The range in the number of adults registered in those courses selected for study was nine to thirty.

Conclusions. Based on a consideration of the findings of this investigation, certain conclusions seem warranted. (1) Tuesday and Wednesday were significantly better than Monday, Thursday and Saturday for scheduling public school adult education courses (there were no courses reported for Friday). (2) Course classification eight, Parent and Family Life Education, was significantly better relative to average daily attendance than any of the other classifications of courses. The following classifications of courses ranked next respectively: Technical and Vocational Education, Home Economics Education, Americanization and Elementary Education, Health and Physical Education, Civic and Public Affairs Education, Arts and Crafts Education, General Academic Education, Music and Drama Education, Safety and Driver Education, Commercial, and Distributive Education. (3) Public school adult education courses having 10 class sessions and those having 12-15 class sessions were significantly better relative to average daily attendance than courses having 3-9 or 11 class sessions.

Implications. The following implications signified by the findings and conclusions of this investigation have a direct bearing on many public school adult education attendance problems that confront teachers and administrators: (1) Public school adult education courses, according to this study, should generally result in better average daily attendance if scheduled on Tuesday or Wednesday in preference to other days of the week. (2) There is statistical evidence from the findings of this study that attendance should be better in Parent and Family Life Education, Technical and Vocational Education, and Home Economics Education courses than in any of the other classifications of courses studied. (3) Attendance should be significantly better, according to this investigation, if courses are planned for 10 or 12-15 class sessions rather than for 3-9 or 11 class meetings.

Microfilm $4.10; Xerox $14.40. 320 pages.

AN EVALUATION OF THREE ADULT EDUCATION METHODS FOR DISSEMINATING TRADE INFORMATION TO MISSOURI RESTAURANT OPERATORS

(Order No. 61-3651)

John Mershon Welch, Ph.D.
The Florida State University, 1961

This is a study of the application of the adoption concept to the evaluation of adult education processes in the field of restaurant management and the analysis of certain characteristics of those who adopted the practices recommended.

Techniques and instruments were developed to evaluate specific educational processes in terms of the degree to which practices recommended were adopted. Additional techniques and instruments were developed to identify certain individual characteristics of participants in terms of their relationship to the adoption of recommended practices. In both cases the data were tested to determine the degree of statistical significance.

Individual characteristics tested included: socio-economic status, social participation, age, education, managerial experience, and sex. Adoption scores measured were: adoption resulting from prior influences, adoption from the adult education processes studied, and total adoption from all sources. Two adult education processes were tested: (1) a group method — the Restaurant Management Clinic, and (2) a mass media application — the distribution of an extension circular. These were combined to form a third process, and both were tested for participant satisfaction by attitude tests.

The four metropolitan areas of Missouri were selected for the study. A Clinic of two day duration was conducted in each of the four areas.

In each of the four areas four random samples were drawn: two from the Clinic roster and two from a list of restaurants in the area from which Clinic participants had been deleted. The extension circular was sent to one sample from each source and was withheld from the other. The fourth sample had no contact with the sources of information. Following an "impact" period of two months, data were collected by a personal interview survey from 100 respondents, divided proportionately among the four samples.

The degree of adoption for each practice recommended was determined by interviewing respondents and by observing the application of the practice in the business. This provided an adoption score from prior influences, from study processes, and a total adoption score.

Findings

1. Each of the three educational processes employed produced significant gains in the adoption of recommended practices. No gains were made by the sample not subjected to study processes.
2. The Clinic was found to be significantly better than the distribution of the extension circular, which was, in turn, significantly better than dependence on indirect influences as processes for the diffusion of trade information to Missouri restaurant operators. Supplementing the Clinic by the distribution of the circular to one sample of Clinic participants did not produce any significant gain in adoption.
3. None of the individual characteristics tested were found to be significantly related to the adoption of recommended practices among Clinic participants sampled. Socio-economic status, social participation, and education were found to be significantly related to the adoption of recommended practices among those sampled from the group receiving the circular and the group having no contact with the sources of information.
4. No channels for the diffusion of trade information through indirect influences were identified as operative within the restaurant industry in Missouri.

Microfilm $2.75; Xerox $7.80. 170 pages.

EDUCATION, HISTORY

THE INTERACTION OF NATURALISM AND IDEALISM IN AMERICAN EDUCATIONAL PHILOSOPHY, 1860-1960.

(Order No. 61-4503)

Donald S. Metz, Ph.D.
The University of Oklahoma, 1961

Major Professor: Lloyd P. Williams

The history of American educational theory in the century between 1860-1960 has been characterized, among other things, by a polar tension involving opposing philosophical approaches to education. At one polar position was traditional idealism, usually couched in Christian terms and symbols. The other polar position expressed educational theory in naturalistic concepts.

An analysis of educational theory in the century under consideration indicates that the first manifestations of tension between naturalism and idealism was expressed in the form of practical idealism versus scientific utilitarianism. At the beginning of the twentieth century rational idealism and pragmatic naturalism were the sources of polar tension between naturalism and idealism.

The educational philosophy of John Dewey is regarded as the most comprehensive statement of naturalism in the history of American education. The educational philosophy of Herman H. Horne is viewed as the most aggressive criticism of naturalism and as the most articulate representation of idealism.

Naturalism and idealism are the two most persistent and influential philosophies in American educational theory. Educational theory and practice inevitably reflect assumptions which are purely philosophical in nature. Metaphysics is thus an essential basis of educational theory and practice. Educational theory and philosophy, regardless of its philosophical outlook, tends to crystalize and to become static at specific levels. In a democratic society it is impossible to impose any particular system of philosophy on the educational structure permanently. It appears that naturalism and idealism will continue to exist in polar tension in educational theory.

American educational theory and practice reflect the social and the intellectual atmosphere in which it operates. The reflection of the cultural outlook by American educational theory suggests that naturalism will continue to expand its influence in educational theory at the expense of idealism, There is a growing demand among certain academic leaders under the influence of both naturalism and idealism to assume more and more intentional control of the social process. The American people possess a naive faith in the power and the ability of education to meet the needs of a democratic society that is unwarranted by a serious study of educational theory.

The tension between idealism and naturalism has contributed to several weaknesses evident in current educational theory and practice. These weaknesses are: (1) the inability of American education to incorporate formal instruction in religion and in values in its program; (2) failure to specify the ideal of citizenship which education is called upon to produce; (3) lack of a knowledge of history and philosophy by those who administer the educational program; (4) a long-standing anti-intellectualism reflected by a large segment of the American people.

Microfilm $3.90; Xerox $13.75. 302 pages.

EDUCATION, PHYSICAL

SPORTS AND GAMES IN ANCIENT EGYPT

(Order No. 61-3321)

Kamal Saleh Abdou, P.E.D.
Indiana University, 1961

Chairman: Markham C. Wakefield

The intent of this study was the compilation of a historical record of sports and games which were practised in ancient Egypt from the prehistoric age until the birth of Christianity. A comparison was made between the ancient Egyptian and Greek sports and games, with reference to their origin, objectives and kinds, in order to investigate the influence of the early cultural contacts between the two countries on sports and games. By surveying procedures and subsequent analysis some light was thrown on the contemporary sports and games which date back to antiquity.

The data in this study were collected from both primary and secondary sources. The primary sources utilized were the paintings, sculptures, and articles pertaining to sports and games which exist in the ancient monuments. In addition, a check list was designed and sent to eighteen historical institutions in order to include all possible original information. Recognition was given to the secondary sources by those historians who participated in the excavations in Egypt and/or in translation and interpretation of hieroglyphic documents.

The scope of today's historical studies is much wider than ever before. In order to think in terms of antecedents and consequents, of course and effect, it was of considerable importance to present a complete picture of ancient Egypt. Hence, each period included in this study was preceded by a survey of its political and cultural aspects.

Based on the analysis of the data the findings may be listed as follows:

1. The predynastic Egyptians practised sports and games for various purposes including recreation.
2. Most of the data pertaining to the Pharaonic sports and games were gathered from the remains of the Old, Middle, and New Kingdoms when Egypt was at its glory.
3. Though most kinds of sports and games seemed to disappear during the periods of weakness or occupation, the boardgames and the childrens' games appeared in the remains of all dynasties.
4. Bull fights seemed to be between two bulls, and not between a man and a bull, as mentioned in some references.
5. Horseback riding appeared as a sport in Egypt, for the first time, after the Hyksos invasion.

6. The Ptolemies attempted to exclude the Egyptians from their athletic organizations and activities. However, after the Great Egyptian Revolution in the fourth Ptolemaic reign, the Egyptians shared these activities with the Greek settlers.
7. Some athletes from Egypt participated in the Greek Olympic games. A few of these athletes were found to be Greek settlers, while the others could not be identified.
8. During the XXVIth Pharaonic dynasty, a committee from Greece visited Egypt seeking the advice of the Egyptian experts to improve the Greek Olympic Games.
9. The Greeks owed their love for sports and games to the Achaeans who came from North Europe. However, several ancient Egyptian sports and games were found to be practised in Greece.
10. The main objective of the ancient Egyptian sports and games was recreation, while that of the ancient Greeks was military.
11. Some of the ancient Egyptians sports and games can be recognized among contemporary activities, especially those practised in Egypt.

Conclusions:

1. The Egyptians seem to have preserved most of their ancient sports and games throughout the ages in spite of the influence of various foreign cultural contacts and dominations.
2. Sports and games were affected by the over-all condition of the country. They flourished when the country was prosperous and declined when society was weak.
3. A number of today's sports and games were known to the Egyptians at least 3000 years B.C.

Microfilm $4.40; Xerox $15.55. 342 pages.

EDUCATION, PSYCHOLOGY

THE EFFECT OF ATTITUDE UPON REFORMULATION-IN-OWN-WORDS

(Order No. 61-3413)

Elmer Robert Adkins, Ph.D.
Columbia University, 1961

Effect of attitude upon reformulation-in-own-words was studied.

Attitude toward Negro was determined by Likert-type scale. Material to be reformulated was either a Pro- or Anti-Negro passage, approximately 500 words to be read. Subjects were 173 students at a small liberal arts college in Maryland, an entire freshman class.

Subjects read one or the other of the passages and without being able to refer to it, wrote it in their "own words." They also completed reading test questions on the passage. Order of reformulation and answering reading questions were interchanged so that the effect of order could be assessed.

Reading questions were scored as measure of specific information obtained from passage by subject. Reformulated passages were processed to obtain readability index. A content analysis was made of each reformulated passage. Principal variables extracted from the analysis were: measure of information obtained from original passage by subject, amount and direction of distortion of that information, and the amount and kind of extraneous material introduced into reformulated passage by the subject.

Three hypotheses were tested:

Hypothesis 1: The more favorable the attitude toward the material, the greater the information and the less distortion in the reformulated passage.

The data did not support this hypothesis.

Hypothesis 2: The effect of interposing the answering of the reading questions between reading of stimulus passage and reformulation, is to decrease information and increase distortion in the reformulated material.

The findings in support of this hypothesis were statistically significant when reading questions were interposed before the Anti passage but not in the case of the Pro passage.

Hypothesis 3: Reformulated material is more readable --has lower readability index--than original passage.

Hypothesis 3a: Students with higher levels of scholastic ability and reading skill are more likely to retain reading level of original passage.

The findings clearly support Hypotheses 3 and 3a.

In the light of previous research, the finding that attitude was not a significant factor in reformulation was somewhat unexpected. In explanation of this finding, it was proposed that the experimental situation had the effect of minimizing the role of individual attitude toward material reformulated, in favor of the group response whereby students did what was expected of them. Subjects had been instructed "not to change the meaning" of the original passage, although it had not been known that they would be able to do so if attitude were dynamic.

The findings with respect to interpolation of material between reading of passage and reformulation, were interpreted to indicate that the process is one of rapid deterioration or forgetting of material rather than failure of information to be initially recoded.

The study suggests that some of the usual and commonplace learning situations in education can profitably be restudied in the light of recent research in communication. The familiar "put-in-own-words" was studied as the reformulation of a communication involving the recoding of verbal material. The content analysis technique enabled a measure of distortion as well as a more comprehensive measure of information.

Microfilm $2.75; Xerox $4.60. 86 pages.

DIMENSIONS OF THE CHARACTERISTICS RELATED TO THE HIGH- AND LOW-ACHIEVEMENT OF A SELECTED GROUP OF NEGRO COLLEGE STUDENTS

(Order No. 61-4498)

Thelma Hill Anderson, Ed.D.
The University of Oklahoma, 1961

Major Professor: Dr. Henry Angelino

The primary purpose of this study was to investigate probable sources of differences between the dimensions of the non-intellectual characteristics of selected groups of high- and low-achieving Negro college students and whether these characteristics showed sex variations.

The non-intellectual traits measured were: personality needs, Edwards Personal Preference Schedule; personality adjustment, Minnesota Multiphasic Personality Inventory; interest, Kuder Preference Record; study habits and attitudes, Brown-Holtzman Survey of Study Habits and Attitudes.

An upper-third ability group of 227 was selected from 669 entering freshmen of Alabama State College, Montgomery, on the basis of their Cooperative School and College Ability Test scores. The Cooperative English, Iowa Silent Reading, and Cooperative STEP Science tests were administered to this group as achievement measures. These test scores were normalized, and an average achievement score derived for each of 220 subjects taking all three tests. High- and low-achieving groups were then selected on the basis of their belonging to the upper or lower quartiles of the distributions. Ninety-six of these group members were matched on the bases of ability, sex, achievement, approximate age, and background to give 48 matched pairs with four sex sub-groups of 24 members each.

The non-intellectual test instruments were administered to the experimental groups, and separate variable scores of the EPPS, MMPI, and KPR tests combined, through partial regression analysis, into composite scores for each of the 96 subjects. Analysis of variance was made on these composite scores and on the SSHA scores.

Significant differences were found in the personality needs, personality adjustment, and interest scores of the high- and low-achieving groups, as shown through F ratios of 9.89 for the multi-variable tests and 7.69 for the SSHA, both of which are significant at the 0.01 level of significance. Sex differences, F ratio of 112.90, significant at the 0.001 level of significance, were found for the multi-variable tests. No significant sex differences were found for the SSHA.

Conclusions:

There are significant differences between the dimensions of the non-intellectual characteristics of personality needs, personality adjustment, interests, and study habits and attitudes possessed by the high- and low-achieving experimental groups of this study. There is also a significant difference between the dimensions of the personality and interest characteristics of the sex groups, but no significant difference between the dimensions of their study habits and attitudes.

Microfilm $2.75; Xerox $5.40. 110 pages.

CHARACTERISTICS OF TEACHER EFFECTIVENESS

(Order No. 61-3182)

Leon Commodore Billingsly, Ed.D.
University of Arkansas, 1961

Major Professor: Roy B. Allen

THE PROBLEM

The purpose of this study was to determine if a group of teachers, judged by their former students to be superior, differ from a random sample of other teachers on certain personality, social, and experience characteristics.

A sub-purpose, which grew out of the study, was to determine if relationships existed between authoritarianism and the sex of the teacher, subject matter taught, or experience.

DESIGN AND SAMPLE

Two groups of teachers were used in the study. One group of teachers was identified by college freshmen as having been the best teacher they had experienced in elementary or secondary school. The second group was selected from participating member schools of the Arkansas School Study Council. The second group served as a control group of "typical" teachers. The two groups were equated as far as teaching experience, sex, and subjects taught were concerned. Each group was composed of 101 public school teachers.

Four instruments, the Minnesota Teacher Attitude Inventory, the Allport-Vernon-Lindzey Study of Values, the California F-Scale, and a Biographical Inventory were selected for use in the study. The instruments were selected on the basis of their purported strength in determining pupil-teacher relationships, interests or motives in personality, and data concerning the characteristics of the teacher. Fourteen variables were measured by the instruments in addition to the Biographical Inventory.

Four statistical techniques--chi square, "t" tests of mean differences, analysis of variance, and factor analysis--were used to analyze the material used in the investigation.

FINDINGS

The significant findings revealed in this study were as follows:

1. There was no significant difference in the scores of the two groups of teachers on the Minnesota Teacher Attitude Inventory and the Allport-Vernon-Lindzey Study of Values.
2. The gifted teachers are more willing to accept their share of the responsibility for poor pupil-teacher relationships than the typical teachers.
3. The typical group of teachers scored higher on the authoritarian scale variables of projectivity, power and toughness, and anti-intraception than did the gifted group of teachers.
4. The typical group of teachers scored higher on the total F-Scale than did the typical group of teachers.
5. The more experienced teachers tend to score higher on the F-Scale.

6. Two factors, political and projectivity, were exerting an influence in the intercorrelations for the typical group of teachers, but not for the gifted group of teachers.

7. One factor, aesthetical, was isolated for the gifted group of teachers, but not for the typical group.

CONCLUSIONS

The conclusions formulated as a result of the findings of this study were as follows:

1. The typical group of teachers tends to be more authoritarian than the gifted teachers.

2. The typical teachers tend more toward assertion of power and toughness than do the gifted group of teachers.

3. The typical teachers are more inclined to believe wild and dangerous things go on in the world, and to project outward their unconscious emotional impulses.

4. The sex of the teacher and subject matter taught do not influence the authoritarian attitude.

5. The more experienced teachers tend to be more authoritarian.

RECOMMENDATIONS

The results of this study suggest these recommendations:

1. The possibility of using an authoritarian scale in the selection of teachers might be explored by school administrators.

2. School officials should take steps to lessen the tendency toward authoritarianism in experienced teachers. This might be accomplished by requiring periodical summer school attendance and the establishment of in-service training programs that would lead to more harmonious pupil-teacher relationships.

3. It is recommended that administrators explore further the possibility of student ratings of teacher efficiency.

Microfilm $2.75; Xerox $5.60. 113 pages.

A STUDY OF COUNSELEE SATISFACTION IN RELATION TO THE INTEREST LEVEL OF FACULTY ADVISERS IN COUNSELING ACTIVITIES

(Order No. 61-3633)

John Phillip Cummer, Ed.D.
The Florida State University, 1961

An examination of the relationship between interest in counseling activities on the part of faculty advisers (as measured by the Professional Activities Inventory for College Teachers, developed by Earl A. Koile) and advisee satisfaction (as measured by a 22-item attitude scale constructed by means of the Edwards-Kilpatrick scale-discrimination method) was conducted at Florida State University during the fall semester, 1960-61.

The major hypothesis tested was as follows: Students counseled by faculty advisers with high interest in counseling will show no significant difference in satisfactions with the help received as measured by their responses to an attitude scale from those counseled by faculty advisers with limited interest in counseling.

Scores on Koile's Professional Activities Inventory for College Teachers were obtained on the faculty advisers counseling freshmen during the fall semester, 1960-61. On the basis of these obtained scores the ten most-interested advisers and the ten least-interested advisers were identified and labeled "high-interest advisers" and "limited-interest advisers" respectively.

Matched samples of advisees of these two groups of advisers were compared for satisfaction. The samples (168 in each sample) were matched by pairs on the basis of sex and by means and standard deviations on the bases of academic achievement and extent of participation in extra-curricular activities (factors previously identified as influencing attitudes toward counseling services).

When the means of scores obtained on the attitude scale by these two matched groups of advisees were compared, it was found that those with high-interest advisers showed greater satisfaction. The difference between the two means was found to be significant beyond the .01 level of confidence. The hypothesis tested is thus rejected.

The faculty advisement attitude scale constructed for use in this study was found to have sufficiently high construct validity as measured by its coefficient of reproducibility of .902, its homogeniety of content, its range of marginal frequencies, and its random scatter of error. Reliability determined by the split-half method was .932. The Spearman-Brown prophecy formula increases this reliability coefficient to .963.

Subjective analysis of interviews held with the 16 most satisfied and with the 16 least satisfied advisees plus analysis of a free-response item presented along with the attitude scale suggest that advisee satisfaction may be related to the knowledge the adviser has of academic factors beyond his own teaching field, the personal interest that he shows in assisting advisees in academic as well as non-academic matters, how readily accessible he is to his advisees (in terms of approachability as well as of time and location), and his being from the same field of major interest as the advisee.

The following implications are noted:

(1) Interest in counseling activities should be ascertained and given serious consideration when assigning faculty members to advising duties.

(2) Even if it is not possible to select faculty advisers with due consideration given to their interest in counseling activities, those advisers who are selected should be provided with complete and accurate information on all academic matters or at least be made aware of where such information is available.

(3) Provision should be made for insuring the ready availability of the adviser to the advisee.

(4) Insofar as possible, advisees should be assigned to an adviser from their own major interest area.

Microfilm $2.75; Xerox $7.40. 159 pages.

THE VALIDATION OF FOUR METHODS OF IMPROVING LISTENING ABILITY

(Order No. 61-3258)

Kenneth Frank Edgar, Ph.D.
University of Pittsburgh, 1961

The purpose of this study was to investigate experimentally whether the listening ability of elementary school children could be improved through training, and to validate four specific training methods. Data were gathered in order to test the following hypotheses: (a) listening efficiency can be increased through training; (b) training materials differing from the criterion (the listening test) will be equally as effective in teaching listening ability as materials which are similar to the criterion; (c) training materials employing the planned interval of silence will result in improved listening ability.

The sample population was selected from grades four, five, and six and examined by means of a specially prepared test of listening ability. Five groups of 47 children each were then formed, matched on the basis of IQ and score on the listening test. The groups were comparable in mean age, and sex differences were randomized. By grades the groups were composed of 14 children from the fourth grade, 19 from the fifth, and 14 from the sixth.

Each group was assigned to a specific treatment: Group I-Exposition; Group II-Story; Group III-Vocabulary; Group IV-Analogies; Group V-Controls. Group I and Group II were randomly divided into sub-groups IA, IB, IIA, and IIB in order to investigate the efficacy of the planned interval of silence. Groups designated by the letter B were trained with materials utilizing planned intervals of silence. Pupils were encouraged to summarize during these three-second pauses. Groups designated by the letter A were not exposed to the planned intervals of silence.

Ten half-hour tape recorded lessons were presented to the subjects in the four experimental groups. Group I listened to expository passages similar to the listening test and answered true-false questions; Group II listened each session to a chapter of an original story titled Yankee Blue and then also answered true-false questions; Group III listened to paragraphs averaging 30 words in length and then proceeded to define an unknown word from contextual clues; Group IV listened to the stem of the oral analogy and then completed the analogy from a selection of four words on an answer sheet. In addition, this group was trained with word series, listening to a series of five words then indicating whether all were unrelated in meaning or two were similar or opposite in meaning; Group V, the control group, read all of the material administered by tape to the other four groups and answered the same questions.

At the completion of the ten periods of instruction, eight weeks from the date of the listening test, the same test was administered again, this time as the post test. The difference scores were treated statistically by means of the analysis of variance and the t test.

Results supported the first hypothesis at the 1 per cent level of confidence. The second hypothesis was not supported. The four methods employed were not equally effective. Analogies, the method judged least similar to the criterion, was found to be equally as effective in the improvement of listening ability as exposition, the method judged most similar to the listening test. The third hypothesis was rejected since mean difference scores for the interval and the non-interval groups were not significantly different.

The findings of this research suggest that the listening ability of pupils in grades four, five, and six can be improved by any of the four methods described. The best method appears to consist of the use of analogies and word series. Microfilm $4.20; Xerox $14.85. 326 pages.

VISUAL PERCEPTION SKILLS OF CHILDREN AND THEIR RELATION TO READING

(Order No. 61-3878)

Shirley Clark Feldmann, Ph.D.
Columbia University, 1961

Visual perception is one of the skills related to reading. The present study attempted to re-examine the conclusions from previous research by investigating the development of visual perception skills and the relation of those skills to reading.

The developmental part of the study examined visual perception skills in relation to age; their relation to intelligence, sex, and handedness was also investigated. It was hypothesized that visual perception skills increase with age, until age 6 or 7 when skills mature and show no further increase, and that girls show more competence in those skills than boys. The second part of the study explored the relation of visual perception and reading skills. It was hypothesized that a relation exists between reading and visual perception skills; the relation is higher in grades 2 and 3 than in grades 4 and 5.

Ninety-five children at each level from kindergarten through grade 5, were measured on the following: intelligence, three visual perception tests, and two reading tests (grades 2-5 only). Grade, age, sex and writing hand were also noted.

General visual perception skills were measured by the Bender Gestalt Test, and form sequence and orientation skills were measured by a specially constructed Reversals Test. The Street Gestalt Completion Test measured use of reduced cues.

For the developmental data, mean scores on the visual perception tests were obtained, by age and grade group. Intercorrelations among all measures were made and two factor analyses were done. Item analyses of the Gestalt Completion and Reversals Tests investigated the nature of those tests.

Test scores measuring general visual perception and form sequence and orientation skills showed development with age. Large score increases occurred in grades 1 and 2; in grades 3, 4, and 5 scores were concentrated at test limits. Scores for both skills were higher for girls at some grade levels. Those scores showed an interrelation in the upper grades; relations in the lower grades were probably attenuated by low test reliabilities.

Scores on the two visual perception tests were highly related to a factor of age-experience, confirming their developmental nature. Intelligence was related to the visual perception scores in the lower grades; it was also highly related to the age-experience factor. That factor

accounted for much of the variance of both the intelligence measure and the visual perception scores.

Scores measuring the use of reduced cues showed no consistent developmental trend, nor any relation to the other measures; also, it was independent of the age-experience factor. Writing hand showed no relation to the visual perception skills. Form sequence and orientation scores showed a change in error type with age, from complete or mixed reversal errors to reversed letter errors to no errors.

Reading skills showed a positive relation to the general visual perception and form sequence and orientation scores. The relation was maintained at all grade levels. Reading skills were highly related to the age-experience factor, thus linking them with the visual perception scores and intelligence in their common factor variance.

Results show a developmental trend in some visual perception scores; those scores are influenced primarily by age and experience. The study supports the specificity of visual perception skills in relation to reading. It indicates that qualitative changes in the relation of reading and visual perception skills may occur with age. These results suggest that lack of synchronization of visual perception and required reading skills might impede school achievement. The prolonged relation found between reading and visual perception scores implies that continued instruction in visual perception skills might be useful in the upper grades.

Microfilm $2.75; Xerox $5.00. 98 pages.

PERSONALITY TRAITS AND MENTAL HEALTH HABITS OF SOCIOMETRICALLY POPULAR AND UNPOPULAR SIXTH AND EIGHTH GRADE STUDENTS

(Order No. 61-3236)

Donald Edgar Guinouard, Ed.D.
Washington State University, 1961

Chairman: W. H. Crawford

An analysis of differences in personality traits and mental health habits between popular and unpopular sixth and eighth grade students was made. Personality traits were measured by the IPAT High School Personality Questionnaire and mental health habits were measured by the Mental Health Analysis. The degree of popularity was determined by a sociometric test for both work and play activities. Differences between sociometric criteria, between grade levels, and between sexes were also analyzed.

The populations studied consisted of 112 sixth grade students and 93 eighth grade students selected from the public schools of Pullman, Washington. The majority tended to be from middle-class families. The populations studied were the upper and lower quarters of their respective grade levels in terms of sociometric work and play status.

A sociometric test was administered to every sixth and eighth grade student. Five choices were allowed for each sociometric criterion. Weighted scores were assigned to the choices and the total weighted scores changed to social scores. The upper and lower quarters were selected from a frequency table of social scores and defined as popular and unpopular. These groups were then administered the HSPQ and MHA. Raw scores were analyzed by the Mann-Whitney U Test for the significance of the differences.

The findings indicated that there were significant differences in personality traits and mental health habits between the popular and unpopular sixth and eighth grade children. Significant differences were also found between the sociometric criteria and between sexes. In general, popular children on both sociometrics and at both grade levels possessed the more desirable personality traits and mental health habits. The findings also indicated that there is a strong and positive movement toward better mental health from the sixth to the eighth grade and that there are significant shifts in personality traits with increased maturation.

The findings emphasized the necessity of having criteria against which to assess personality traits and mental health habits. Separate norms for different grade levels, each sex, and other groups of concern to the school and community were also suggested. Periodic use of multi-dimensional instruments for personality and mental health appraisal was indicated for longitudinal studies and for prophylactic guidance. The results also showed a strong and reliable tendency for eighth grade children to possess better mental health than sixth grade children and suggests that late childhood may be a period of greater stress than normally believed. Extending more and better guidance down into the elementary grades was implied.

Microfilm $2.75; Xerox $5.60. 115 pages.

A STUDY OF THE RELATIONSHIP BETWEEN THE SIXTH GRADE STUDENT'S BELIEFS ABOUT JUNIOR HIGH SCHOOL, HIS CONCEPT OF SELF AND OTHERS, AND HIS SOCIO-ECONOMIC STATUS.

(Order No. 61-3639)

Samuel D. Harris, Jr., Ed.D.
The Florida State University, 1961

This study was concerned with the articulation of elementary and secondary education. Specifically, it dealt with the articulation of the elementary and junior high school (grades 7-9). This was an exploratory study designed to reveal what sixth grade students believe about junior high school and to determine the relationship of these beliefs to the subjects' self-other concepts (acceptance of self and beliefs about peers' self-acceptance) and their socio-economic status. The effect on the subjects' beliefs of eventually attending differently organized junior high schools also was considered.

The 818 boys and girls used in the study were enrolled in eleven selected white public elementary schools located in four Florida cities. The schools were selected on the basis of the curriculum pattern of the junior high school they "feed." Three patterns were considered: "departmental," "block-of-time," and "self-contained classes."

The beliefs concerning junior high school were determined from compositions written by 128 subjects. The beliefs which were identified and considered in the study were related to the following: (1) amount, nature, and

difficulty of junior high school work; (2) time allowed for doing this work; (3) amount of homework; (4) strictness and helpfulness of junior high school teachers; (5) liking and being liked by these teachers; (6) expected number of friends; (7) conduct of junior high school students; (8) organization of junior high school; (9) quality and strictness of the junior high school they will attend; (10) failure to meet seventh grade standards; (11) parental expectations; (12) increased freedom; (13) participation in student activities; and (14) information received concerning junior high school.

A questionnaire based on these beliefs was employed in obtaining data from 493 subjects for use in testing three null hypotheses. The Index of Adjustment and Values was used to obtain a measure of these subjects' self-other concepts. Their socio-economic status was determined through the use of the Index of Value Orientation.

The following conclusions were made as a result of testing the four null hypotheses of the study using chi square tests and the .05 level of significance. No relationship was found to exist between the subjects' beliefs concerning junior high school, as identified in this study, and each of the following: (1) the curriculum pattern of the junior high schools which the subjects will attend; (2) the subjects' self-other concepts; and (3) the subjects' socio-economic status. A significant relationship was found to exist between the subjects' self-other concepts and their socio-economic status with a higher incidence of those with more desirable self-other concepts found among the highest social class and a higher incidence of those with the least desirable self-other concepts found among the lowest social class.

Other conclusions were as follows: (1) since a high degree of interest in junior high school is indicated among first-semester sixth grade students, this interest could be capitalized upon by those planning articulation programs; (2) since some erroneous beliefs concerning junior high school were found among the subjects, early recognition of these and appropriate articulation activities could allay anxieties which might otherwise result; and (3) the procedures utilized in this study provide a fruitful means of obtaining from children data relative to situations in which they are involved or soon will be involved.

Microfilm $2.75; Xerox $8.40. 181 pages.

ANXIETY, n-ACHIEVEMENT, APTITUDE, AND PRIOR KNOWLEDGE AS PREDICTORS OF COLLEGE ACHIEVEMENT.

(Order No. 61-3851)

William Russel Jensen, Ed.D.
The University of Nebraska Teachers College, 1961

Adviser: Robert E. Stake

This study was based on the hypothesis that college achievement is determined by the interaction of motivation and ability. If relevant personality variables were measured, it was proposed that they would account for a significant proportion of the variance left unaccounted for by measures of aptitude and prior achievement. A theoretical formula was proposed for the selection of the variables and the instruments for the measurement of these variables were determined on the basis of their apparent relevance. The instrument for the measurement of achievement was the grade for course or the final examination grade; Taylor MAS and McClelland's n-Ach technique were adopted for the measurement of motivation; the ACE "L" score was used to determine aptitude; and a pretest or grade for prerequisite course was employed as a measure of prior knowledge.

The population consisted of 193 students for whom all measures of the various variables were secured. The 149 women and the 44 men who comprised this sample were enrolled in an Educational Psychology class at the University of Nebraska. The two sexes were studied separately in order to determine the differences that might exist between sexes in the amount of variance accounted for by the variables under study. Fifty-two of these students were also enrolled in an English course; 31 were enrolled in a Sociology course; and 36 were taking a History course. These subgroups were studied in an effort to determine differences that might exist between courses.

A pretest was constructed and administered to the Educational Psychology subjects at the very start of the course in September 1960. McClelland's n-Ach test was administered under neutral conditions and was followed by the Taylor Manifest Anxiety Scale. A majority of the other variable measurement scores were available but supplementary testing periods were held for the purpose of securing complete data on as large an N as possible.

The initial analyses of data were accomplished by means of an electronic computer and the final analyses of regression and variance were accomplished by using the deviation data thus acquired.

The results of this investigation were:

1. The Taylor MAS had a significant correlation with achievement for male subjects but the correlations with female and mixed-sex groupings were not significant. The elimination of the Taylor MAS from the multiple regression formula was not a significant loss for male, female, or mixed-sex groupings.
2. The n-Ach variable, as measured by the McClelland techniques, failed to correlate significantly with any of the variables and its contribution to the explanation of variation in achievement was very minimal.
3. A combination of the Taylor MAS and n-Ach did not make a significant contribution to the prediction of achievement when added to measures of aptitude and prior knowledge.
4. The value of the Taylor MAS or the n-Ach did not vary to any great extent from course to course except for the value of the Taylor MAS for male subjects as mentioned above.
5. Approximately 60 percent of the variance in achievement scores still remains unaccounted for when all of the variables were measured by the methods employed in this study.

Microfilm $2.75; Xerox $6.00. 123 pages.

SELECTED PERSONALITY, INTELLECTIVE, AND COMMUNITY CHARACTERISTICS AS RELATED TO ACADEMIC SUCCESS OF UNIVERSITY OF GEORGIA STUDENTS.

(Order No. 61-3832)

William Lindsey Mock, Ed.D.
University of Georgia, 1961

Supervisor: Joseph C. Bledsoe

The purpose of this study was to determine to what extent five community background characteristics and two personality factors contribute to the prediction of academic achievement of University of Georgia students in the first two years of college work. The five community background characteristics were the Number of Students in the High School Graduating Class, the Median Income of the White Population of the County in Which a Student Resides, the Median Income of the Total Population of the County of Student Residence, the Median Educational Level of the White Adults over Twenty-Five of the County in Which a Student Lives, and the Median Educational Level of All Adults over Twenty-Five of the County of Student Residence. The two personality factors were Achievement Motivation and Self-Ideal Concept. A cross-validation research design was chosen to test the hypotheses formulated for the study. The major hypothesis was: Five community background characteristics or two selected personality factors will not contribute significantly to the prediction of academic success of University of Georgia students.

The 471 subjects for the study were chosen from a group of sophomores who entered the University as freshmen in September 1958 on the basis of the following criteria: Each entered the University for the first time in September 1958, each was a resident of Georgia, each had no previous college experience, each was administered the Sophomore Comprehensive Examinations (STEP) in May 1960, and each completed the Index of Study and Work Skills which was administered to all freshmen who entered the University in September 1958.

Achievement Motivation was significantly related to average college marks for both men and women at the .01 level of confidence while Self-Ideal Concept was significant at the .01 level for men but was not significant at any level for women. Of the five community background characteristics, only the $\underline{r}$ between the Median Educational Level of All Adults Over Twenty-Five of the County of Student Residence and average college marks for men was significant. None of the remaining community background characteristics for men or women was significantly related to a student's average college marks after two years of study at the University.

For both men and women, ten coefficients of multiple correlation were computed, using various combinations of selected prediction variables. Since the community background characteristics had low $\underline{r}$'s with the criterion (two-year average marks), they were not included in the multiple regression equations except for the Number of Students in the High School Graduating Class which was included in computing a number of $\underline{R}$'s for females. Eliminating the Sophomore Comprehensive Examination scores (STEP), which were obtained after the students had attended college for two years, the highest $\underline{R}$ for men was .623 using High School Average, SAT-Mathematical and Achievement Motivation. Disregarding STEP scores, the highest $\underline{R}$ for women was .670 using the Number of Students in the High School Graduating Class, High School Average, SAT-Verbal, and SAT-Mathematical.

Microfilm $2.75; Xerox $7.80. 167 pages.

A COMPARATIVE STUDY OF SELECTED FACTORS IN THE VOCATIONAL DEVELOPMENT OF COLLEGE WOMEN

(Order No. 61-3220)

Aileen Webber Parker, Ed.D.
Indiana University, 1961

Chairman: Merrill T. Eaton

The major purpose of the present study was to investigate the role of marriage and career orientations in the vocational development of college girls. Specifically, it was hypothesized that in their vocational development marriage-oriented, career-oriented, and career-marriage-oriented sophomore, junior, and senior college girls differ on the basis of the following factors: (1) Personality characteristics; (2) Interests; (3) Socio-economic status; (4) Achievement; (5) Time of emergence and persistence of occupational preferences; (6) Key figure influence; and (7) Paid work experience. It was hypothesized that marriage-oriented girls would have more A and B+ scores on the occupational scales of the Strong with positive male-association factor loadings and that career-oriented girls would have more A and B+ scores on the occupational scales with negative male-association factor loadings.

An inventory including a marriage attitude scale and a career attitude scale was constructed to provide a tool for selecting ten girls for each of three groups, the Marriage Group, the Career Group and the Mixed Group. Items were selected for each scale by the method of internal consistency. A Likert-type key was used for scoring the items. Test-retest reliability was found to be .83 for the career scale and .92 for the marriage scale.

Data were collected from three primary sources, an interview, college records, and three objective instruments including the Strong Vocational Interest Blank for Women, Form W., Edwards Personal Preference Schedule and the Home Index. Three impartial judges ranked case study summaries on scales constructed around three areas, key figure influence, emergence and persistence of occupational choices, and work experiences. Agreement among the judges was determined by the coefficient of concordance method and the F test was applied. Significant agreement among the judges was found.

The Chi Square median test was applied to data pertaining to achievement, socio-economic status, personality characteristics, key figure influence, emergence and persistence of occupational preferences and paid work experiences to test the significance of the differences. Findings indicated no differences among the three groups in respect to these factors. Six parts of the basic hypothesis were rejected.

The Chi Square contingency test was applied to test the significance of difference among the three groups with

respect to vocational interests. Findings substantiated the hypothesis that in their vocational development marriage-oriented, career-oriented, and marriage-career-oriented girls differ in respect to the number of A and B+ scores received on occupational scales of the Strong with positive and negative male-association factor loadings.

From a comparison of relationships between the two attitude scales and selected factors in vocational development, it was found that there was a tendency for marriage-oriented girls to have high grade-point averages, high socio-economic status, and interests similar to the average elementary school teacher. There was a tendency for career-oriented girls to have interests similar to the average librarian. Socio-economic status, achievement and work experience were found to be relatively independent. It was also found that in their vocational development, there is a tendency for girls with more work experience to have had their occupational preference for a shorter duration of time. Microfilm $2.75; Xerox $5.80. 118 pages.

INTERCORRELATION OF RIGIDITY TEST SCORES AS A FUNCTION OF HOMOLOGY

(Order No. Mic 61-1776)

Esther Rebekah Reynolds, Ph.D.
University of Michigan, 1961

The purpose of this study is twofold: (1) to attempt to increase the correlation of certain tests of rigidity by the refinement of them on the basis of increasing homology, (2) to determine the relation of one, two, and three sets to measured rigidity. Tests are considered homologous if they have a highly similar structure, and call for behaviors which are also similar in form.

The present work is an attempt to test the explanation that low correlations so far reported are partly accounted for because the various tests of rigidity are based on different meanings of rigidity, and because the test forms and test behaviors are too dissimilar.

The major hypothesis states that the refinement of certain tests supposed to measure rigidity, toward increasing homology, will increase the correlation between these tests.

The minor hypothesis states that there will be no difference in measured rigidity, or learning, among the four experimental groups when measures differ only in the number of ways, or demonstrated solutions, or sets, that are given to them at the beginning of each test.

The restriction of the term rigidity to mean any failure to change appropriately under conditions requiring change was accepted as the basic definition. Added to this as a result of the present study is a second part namely, inability to follow the appropriate directions.

The test battery consists of the following tests: Hidden Words; Hidden Objects; Digit Symbols; Luchins Einstellung Water-Jar Test; and an original Spelling Test. Luchins Einstellung Water-Jar Test was used as the pivot test for increasing homology. The first two puzzles of each test are practice problems. Puzzles three through eight are Einstellung puzzles for the purpose of establishing the three sets.

Scores on the Number 9 extinction puzzle can be either zero or one. A score of zero means failure to make the appropriate, required change, and this zero indicates rigidity. A score of one indicates flexibility or fluency. Chi Square was used for testing significance of differences between the two groups and the Phi Coefficient was used as a measure of association.

There are two groups of subjects: fifty-six sixth graders and forty-one graduate students.

Test results reveal that the Phi Correlations are low with only one reaching the one per cent level of significance. Analysis of the major trend of all correlations indicates clearly the need for more items in the extinction puzzle which demands change. This is a new innovation tried only in the Spelling Test. This refinement would provide a variability spread of those who can make the required appropriate shift and those who cannot, and would also eliminate so many zeros in the scoring, thus providing a more nearly normal distribution which would facilitate statistical analysis.

A follow up study using this change is planned and present analysis indicates that test homology would then function effectively.

There is no evidence that set instructions either increased or decreased the rigidity score except in Hidden Objects for Group II in Sixth Grade. This test is pictorial and visual and may be measuring a different skill that is related to rigidity in a different way. Rigidity may be reflected differently in different skills even though the tests themselves are homologous. Part of the present battery, especially Hidden Objects, offers possibilities of value in diagnostic work.

All test results have been carefully analyzed and clearly presented in twenty-five tables. There is little positive correlation between IQ and rigidity scores.

Microfilm $2.75; Xerox $6.20. 126 pages.

THE RELATIONSHIP BETWEEN ANXIETY AND THE DISPARITY OF READING AND ARITHMETIC ACHIEVEMENT

(Order No. 61-3248)

Thomas David Rowland, Ed.D.
Washington State University, 1961

Chairman: Lloyd B. Urdal

Since the origin of formal mental measurement there has been considerable interest in finding facets of personality or adjustment which will contribute to the prediction of academic success other than mental ability itself. In the last ten years there has been some interest in ascertaining why achievement disparity exists and when it does exist does it suggest any particular problem of adjustment for the children.

Various authors have suggested that anxiety may be associated with better reading ability than arithmetic. They also considered higher arithmetic skills to be associated with problems of a social aggressive nature. While this study did not concern itself with the etiology of either disparity or anxiety it was designed to demonstrate their relationship to each other. It seemed important to know

if the knowledge of a child's disparity would reveal the level of anxiety. It seemed important also to be able to predict disparity from a known level of anxiety.

This study was concerned with the relationship of anxiety, as measured by the Children's Manifest Anxiety Scale, to the disparity of reading and arithmetic, as measured by the Iowa Basic Skills Test. This study involved the study of four groups significantly different in areas of anxiety, lie, intelligence, reading, arithmetic and total level of achievement. The total population was comprised of 659 sixth grade boys and girls enrolled in the Yakima Public Schools.

Disparity was determined by algebraically subtracting the standard scores of arithmetic from reading. The anxiety raw scores were changed to standard scores.

It was found through Pearson Product-Moment correlations that none of the four groups yielded significant correlations between the variables, anxiety and disparity. Some of the correlations were elevated. However, the hypothesis that anxiety is directly associated with disparity could not be accepted.

It was hypothesized that a higher level of achievement may influence anxiety to cause greater disparity in favor of reading. Likewise, anxiety in children working below the level of their peers, may be inversely related to disparity, that is, arithmetic would be expected to be greater than reading. Each of the original four groups were separated at the mean of the level of achievement for the sex and culture which they represented. This resulted in the study of eight groups of children separated for sex, culture and level of achievement. While the additional separation and study of these children, according to the level of their achievement, yielded some higher correlations they were not necessarily in support of the hypotheses and were so low as to be considered nonsignificant.

Microfilm $2.75; Xerox $4.20. 79 pages.

CHANGES IN THE ORGANIZATION OF MENTAL ABILITY AMONG SECONDARY SCHOOL YOUTH

(Order No. 61-3854)

Douglas D. Sjogren, Ed.D.
The University of Nebraska Teachers College, 1961

Adviser: Warren R. Baller, Ph.D.

Purpose

The purpose of the present study was to determine the extent to which changes occur in the organization of mental ability among secondary school youth, specifically ninth and twelfth grade students. The hypothesis examined was that mental ability is more specific in the twelfth-grade student than in the ninth-grader.

Method and Procedure

A principal axes factor analysis was applied to four matrices of intercorrelations obtained from Project Talent. The matrices contained correlations between the mental ability tests administered in the project. The correlations of 33 of the tests were used for the factor analysis.

Project Talent is a testing program involving a nationwide sample of 450,000 secondary school youth. The matrices used in the present study were derived from the test scores of a four per cent random sample of the total sample. The matrices were developed from data on 1152 ninth-grade boys, 990 ninth-grade girls, 1153 twelfth-grade boys, and 1250 twelfth-grade girls respectively. The average age was 15 for the ninth-grade groups and 18 for the twelfth-grade groups.

Nine principal axes were rotated by the varimax criterion method and five by the graphical method. This was done in order to determine how definite the factor structure was in each group.

Results of the Study

The data of the present study illustrated that in the sample used there was a first factor in each group which accounted for about sixth per cent of the variance in the correlation matrix. This factor was interpreted as a general factor of mental ability. The evidence indicated that the twelfth-grade groups had more significant factors, and that the minor significant factors (those immediately succeeding the first factor) were more powerful than in the ninth-grade groups.

However, after reviewing the evidence and the method used in the study, the investigator concluded that there is not a final resolution to the problem of whether mental ability becomes more specific with increased age. The unresolvability rests in the nature of the tests used. If factorially equivalent tests are used with two different age groups a difference in the factor patterns of the groups is an indication of a difference in the organization of mental ability of the persons tested. But if the tests are not factorially equivalent a difference in the factor patterns could be the result of the non-equivalence of the tests rather than a difference between the groups. Also the tests used must be interval-scale instruments, but the nearest thing to interval-scale tests available are tests with scales based on the variance of the norm groups. A test scaled on observed variance cannot be used in the comparison of observed variances.

The final conclusion of the present study was that the evidence indicated only that on the battery of tests used in the study, the twelfth-grade students of the sample showed more specificity of mental ability than the ninth-grade students. Further generalization seemed to be dependent on rather extensive assumptions. If it could be assumed that the tests were interval-scale tests and factorially equivalent, and that the samples were representative of each age group, then the data of the study indicated that there is greater specificity of mental ability with increased age. Microfilm $2.75; Xerox $6.00. 121 pages.

THE INTERRELATIONSHIPS OF THE CONCEPTS OF SELF AND OTHERS, SOCIAL ACCEPTABILITY, AND CURRICULUM PATTERNS.

(Order No. 61-3649)

Betty Lentz Spence, Ph.D.
The Florida State University, 1961

Essentially the problem in this study was to ascertain in a specific population of junior high school students whether there was a relationship between the following: (1) the self-others concepts and social acceptability of junior high school students, (2) the self-others concepts and social acceptability of junior high school students who experience the traditional curriculum pattern, (3) the self-others concepts and social acceptability of junior high school students who experience the block of time curriculum pattern, and (4) the self-others concepts and social acceptability of junior high school students who experience the self-contained curriculum pattern.

Further analysis of the data was conducted concerning the relationship of self-others concepts and social acceptability of junior high school students differentiated by sex and grade. Still further analysis of the data was made concerning the relationship between junior high school students' self-others concepts and curriculum patterns and the relationship between junior high school students' social acceptability and curriculum patterns.

Eight hundred twenty-four young adolescent boys and girls made up the population sample of this study. The subjects were the students in twenty-seven representative seventh, eighth, and ninth grade classrooms in three large junior high schools. Each of the participating schools was comparable in size of teacher and pupil population. The schools drew from comparable socio-economic areas. The three schools were selected in such a manner that they represented the following curriculum patterns: the traditional, the block of time, and the self-contained.

The Index of Adjustment and Values was used to reveal the self-others concepts of the subjects. The Ohio Social Acceptance Scale was used to reveal the social acceptance ratings of the subjects.

The data were tested by the chi square test for significance at the .05 level of significance.

The following conclusions may be drawn concerning this specific population of junior high school students. These conclusions are subject, of course, to the limitations imposed by the conditions of the investigation.

1. Junior high school students' self-others concepts and their social acceptance by their peers are essentially unrelated.
2. The relationship of junior high school students' self-others concepts and their social acceptability appears to be unrelated to the kind of curriculum pattern which the students experience.
3. Junior high school students' self-others concepts and the kind of curriculum pattern which they experience are essentially unrelated.
4. A relationship appears to exist between junior high school students' social acceptability and the kind of curriculum pattern which they experience.
5. A higher incidence of junior high school students who are socially accepted by their peers appears in both the self-contained and the block of time curriculum patterns than in the traditional curriculum pattern.

Microfilm $2.75; Xerox $8.20. 179 pages.

A THEORETICAL AND EMPIRICAL STUDY OF DECISIONAL BEHAVIOR OF TEACHERS

(Order No. 61-3226)

Harold LeRoy Stahly, Ed.D.
Indiana University, 1961

Chairman: Richard L. Turner

Teacher behavior is considered to be activity based in large part upon a process of decision making. The construct "decision" implies choice; thus the study of teacher behavior from this point of view focuses upon behavioral choice points, or situations in which the teacher is confronted with two or more alternative courses of action.

It is assumed that behavior in a decisional situation is based to a considerable extent upon cognitive functioning. In other words, the teacher who has clearly formulated educational objectives and a knowledge of human behavior can through the processes of perceiving, thinking, judging, and problem solving arrive at teaching decisions.

The major emphasis of this discussion, however, was not directly upon cognitive processes themselves but rather upon other factors which influence these processes. The study consisted of two parts: a theoretical analysis of factors influencing decisional behavior and an empirical investigation of a part of the hypotheses generated in the analysis.

The analysis considered the part played in decisional behavior of the following factors: social interaction of teacher and class, role definition and role conflict of the teacher, interpersonal perceptions of the teacher, and teachers' attitudes and attitude structures.

The empirical study tested hypotheses regarding relationships among interpersonal perceptual variables, attitudinal variables, and stated decisions of teachers in response to printed descriptions of pupil behavior problem situations.

Interpersonal perceptual variables were measured with the Role Construct Repertory Test, attitudinal variables with the California F Scale and the Minnesota Teacher Attitude Inventory, and teacher decisions with a Teacher Decisions Inventory developed by the writer. Subjects in the study were 112 elementary and secondary teachers from the Midwest.

Major findings of the empirical study follow.

1. Teachers who more frequently say they would punish the pupil in a disciplinary situation tend to be more authoritarian (as measured by the F Scale), to have more negative attitudes toward school-related objects (as measured by the MTAI), to perceive other persons less frequently in negative terms (as measured by the Rep Test), and to be younger.

2. Teachers who more frequently say they would use verbal appeal to pupils to conform in a disciplinary

situation tend to be more authoritarian and to perceive others less frequently in negative terms.

3. Teachers who more frequently say they would seek additional information in seeking a solution to disciplinary situations tend to be less authoritarian, to have more positive attitudes toward school-related objects, and to be older.

4. There is a rather marked positive relationship between authoritarianism and negative attitudes toward school-related objects.

5. The more highly authoritarian teachers tend to perceive other persons less frequently in negative terms and more frequently in superficial, impersonal terms (as measured by the Rep Test).

Microfilm $2.75; Xerox $6.20. 128 pages.

A COMPARISON OF THE TEMPERAMENT TRAIT, INTEREST, ACHIEVEMENT, AND SCHOLASTIC APTITUDE TEST SCORE PATTERNS OF COLLEGE SENIORS MAJORING IN DIFFERENT FIELDS AT THE ARKANSAS STATE TEACHERS COLLEGE.

(Order No. 61-3192)

Robert Paul Witherspoon, Ed.D.
University of Arkansas, 1961

Major Professor: Glenn A. Cole

The purpose of this study was to determine if scores on the Guilford-Zimmerman Temperament Survey, the Kuder Preference Record (Vocational, Form C) and the American Council on Education Psychological Examination (1952 Edition) all given to freshmen, and the Cooperative General Culture Test (Form A) given to sophomores, would form distinctive profile patterns for Arkansas State Teachers College seniors in the various major fields.

The freshmen and sophomore test scores of students who were seniors during the school years 1957-58, 1958-59, 1959-60, and 1960-61 were obtained. These students were divided into 15 major groups for men and 15 for women. The means and standard deviations were computed from the raw scores for each major on the 28 separate scores available from the four tests. The raw score means and standard deviations were converted into the corresponding percentile scores using national norms. A profile chart was designed so that the profile pattern made on the four tests by each major group could be plotted on it. The scores of each major group of men were plotted on a profile chart with the percentile mean scores of all the men plotted on it as a basis for comparison. The same was done for the women majors. The percentile scores were considered significant for descriptive purposes if they were 25 percentile points above or below the 50th percentile by national norms, or were 25 points above or below the ASTC means.

The various major fields had distinctive profile patterns, and the results of this study have shown the feasibility of identifying these majors early in their college careers. The interest test scores seem to be the most useful in identifying these majors, but the other tests did contribute toward describing other characteristics of the various major fields.

Some illustrative patterns are as follows. A high score is one above the 75th percentile and a low score is one below the 25th percentile by national norms.

The men art majors were low on the E and O scales of the Guilford-Zimmerman Survey; low on the outdoor, mechanical, computational, and scientific scales of the Kuder Inventory, but high on the artistic, persuasive, and literary scales.

The women art majors were low on the G and O scales of the Guilford-Zimmerman and high on the artistic scale of the Kuder.

The men biology majors were high on the scientific scale of the Kuder, but were low on the literature and fine arts sections of the General Culture test.

The women biology majors were high on the P scale of the Guilford-Zimmerman, but were low on the M scale. They were high on the scientific, mechanical, social service, and outdoors scales of the Kuder, but had low scores on the musical, persuasive, and clerical scales. They were high on the science and mathematics sections of the General Culture test.

The men business majors were high on the clerical interest scale of the Kuder; and the women were high on the clerical and computational scales of the Kuder, but were low on the social studies and fine arts sections of the General Culture test.

It is recommended that this study be put on a continuing basis at ASTC. The profile patterns for drop-outs should be determined. The graduates of ASTC should be studied to determine if the profile patterns of successful and unsuccessful teachers differ. There would appear to be value in determining the profile patterns of seniors in the different colleges of a university and in comparing the profile patterns of students in the various colleges in a state.

Microfilm $2.75; Xerox $6.60. 139 pages.

EDUCATION, RELIGION

A NORMATIVE DESCRIPTION OF THE ROLE OF THE CERTIFIED DIRECTOR OF CHRISTIAN EDUCATION IN THE METHODIST CHURCH

(Order No. 61-3399)

Wayne Moore Lindecker, Jr., Ph.D.
Boston University Graduate School, 1961

Major Professor: Donald M. Maynard

Problem: To describe normatively the position of the certified director of Christian education in The Methodist Church.

Procedures: Library research, questionnaire, and interviews of groups of respondents and individual respondents.

Findings and Conclusions: (1) The library research traced the historical developments of the vocation of the employed local church director of Christian education in

the Protestant churches and in The Methodist Church from its beginning in 1908, to the present time. This research supported the assumption that a description of the position of the director of Christian education is needed.

2) The questionnaire was sent to the pastor, the director, the chairman of the commission on education, and the church school superintendent in the 355 local churches where Methodist directors are employed. Fourteen hundred nine questionnaires were mailed. Seven hundred thirteen usable questionnaires were returned for a response of 50.6%. Seventy-five and seven-tenths per cent of the directors returned questionnaires. Significant areas of agreement and of disagreement were revealed among the four leaders concerning the work of the director.

3) Interviews were held with twelve individual respondents and with two groups with all four respondents, and one group in which three of the four respondents were included. Findings from the interviews were compared with those from the questionnaire and, although not an adequate sample, supported the findings from the questionnaires.

4) A normative description of the certified director of Christian education in The Methodist Church was formulated upon the basis of the research data. Normative description is used in this case to mean a statement of what ought to be the nature and work of the director. The following paragraphs are a summary of the normative description.

A director in The Methodist Church is employed by the Quarterly Conference. The director is responsible to the pastor. He shares the ministerial function in a church large enough to need more than one minister on the employed staff. The specific assignment of the director is to guide the educational program of the church. He participates with other members of the employed staff in total church program development.

The scope of the work of the director includes all that the church does that teaches. The director guides the commission on education, and works with teachers and officers of the educational program. He helps organize the work of Christian education. He helps persons know their jobs and helps them develop skills to do their work effectively. The director provides needed leadership functions in the educational program until indigenous leadership can be enlisted and trained. The director does not replace lay workers in responsibilities, but helps to see that persons are enlisted and trained for positions of service in the educational work of the church. The director works with teachers and officers as they need his guidance when they carry out their responsibilities.

Educational projects of the district, the annual conference, and the council of churches are an extension of the educational program of the local church, and as such should be a part of the director's responsibility.

The work of the director should be defined in each church so he knows what to expect and so others in the church know what to expect of the director. The local church job analysis should be flexible so as to allow for the varied nature of the director's job. The specifics of the job of the director vary from church to church. It is important that each church where a director is employed create a specific job analysis for the work of the director in that church.

Microfilm $3.00; Xerox $10.35. 230 pages.

EDUCATION, TEACHER TRAINING

THE COMPREHENSION OF FIGURATIVE LANGUAGE BY ELEMENTARY CHILDREN: A STUDY IN TRANSFER.

(Order No. 61-3835)

Hulda Gwendolyn Groesbeck, Ed.D.
The University of Oklahoma, 1961

Major Professor: Professor Arthur W. Heilman

This study proposed to investigate (1) the ability of third, fourth, and fifth grade pupils to transfer training in the interpretation of figurative language, and (2) the figurative language content of elementary reading and social studies textbooks. Relationships between knowledge of figurative language and other variables were also explored.

Subjects selected for the experimental study were a third, fourth, and fifth grade class from each of two public schools. All pupils were pre-tested in reading, vocabulary, figurative language, and mental ability. Experimental groups were given ten twenty minute lessons in the interpretation of figurative language. No expressions from their basal texts were used in these lessons. Four weeks later, all subjects were administered post tests in the interpretation of figurative language. All test items were taken from text materials covered prior to the administration of this test. Experimental and control groups were equated statistically and differences in achievement on post tests were computed. Intercorrelations were obtained for figurative language, reading, vocabulary, and mental test scores.

Pupils who received training showed highly significant gains over control groups on post test scores. No significant differences in achievement were found between sexes. For groups as a whole, correlations between knowledge of figurative language and other variables ranged from .61 to .65. Correlations between pre-experimental tests and figurative language post tests were markedly more consistent for control than for experimental groups. Intercorrelations among pre-experimental variables were in every case higher for boys than for girls.

This investigation gave evidence of the positive effects of training in the interpretation of figurative language upon elementary pupils and of their ability to apply interpretative skills to later learning. Major recommendations suggested by this study are: (1) Teachers should attempt to ensure all children's comprehension of the figurative expressions they encounter. (2) Children in upper elementary grades should be given specific training in the interpretation of figurative meanings.

In the textbook survey, figurative expressions occurring in third, fourth, and fifth grade texts comprising two reading series and one social studies series were listed in context by subject, grade, and series. Types of figurative language noted in the survey were presented and discussed. Comparisons were made between grades, subjects, and reading series.

On the basis of this survey, the numbers of figurative expressions which may be encountered by pupils in their basal reading and social studies textbooks are: grade three, 582; grade four, 837; and grade five, 1,337. Comparisons between subjects and between reading series

disclosed marked inconsistencies. In all texts, figurative content increased from each grade to the succeeding level.

Metaphors, similes, onomatopoeia, personfications, expletives, and antitheses occurred most frequently in these textbooks. Many figurative terms were in the form of colloquialisms, slang, and jargon. Functional shifts and multiple meanings were observed frequently on all levels.

It is strongly recommended that greater consideration in the construction and use of elementary textbooks be given to these meanings which deviate from the common or literal. Microfilm $4.90; Xerox $17.35. 383 pages.

TRENDS IN TEACHER CERTIFICATION IN FLORIDA, 1936-1961.

(Order No. 61-3646)

Marlin Crosby Sanders, Ed.D.
The Florida State University, 1961

This study was related to the certification of elementary and secondary teachers for the public schools of Florida. Primarily it was designed to document trends from 1936 to 1961 (1) in the certification of teachers respecting teacher education requirements, including general and professional preparation and specialization, and (2) in the participation, directly or indirectly, in the determination of requirements by the State Legislature, the State Board of Education, the State Superintendent of Public Instruction, the State Teacher Education Advisory Council, teacher training institutions, professional organizations of school personnel, and organizations representing the lay public.

The development of requirements for teacher certification was traced through a search of the Florida Statutes, Certificate Bulletins of the State Department of Education, The Florida School Bulletin, Journals of the House of Representatives, Journals of the Senate, Journals of the Florida Education Association, reports of the Legislative Interim Committee on Education, the Florida Teacher Education and Professional Standards Commission, and the Continuing Educational Council, and minutes of the State Board of Education and the Florida Teacher Education Advisory Council. Also, State Department of Education personnel, who had responsible connections with teacher certification during the time-span, were interviewed.

Major discernible trends in the certification of Florida teachers were documented as follows:

1. From issuing certificates almost completely on the basis of examinations to granting certificates solely on the basis of completion of college programs of teacher education.
2. From requiring no college training to requiring increasing amounts of educational training for the standard certificate.
3. From no differentiation toward distinction among certificates with reference to amounts of college preparation.
4. From little or no safeguarding of proportion in the general, special, and professional phases of college preparation toward minimal quantitative specifications for preparation in the three phases.
5. From requiring specific courses in the phases to establishing requirements in terms of broad areas.
6. From certification policies and requirements very largely determined by teacher training institutions toward policies and requirements determined cooperatively by major groups affected, including the lay public.
7. From life certificates to credentials with a long period of validity but with a definite termination.
8. From certification on the basis of specifics of college transcripts toward certification on the basis of completion of regionally and nationally accredited programs of teacher education.

Microfilm $2.75; Xerox $7.60. 163 pages.

SOME ASPECTS OF SCIENCE EDUCATION FOR RURAL PHILIPPINES AND IMPLICATIONS FOR THE EDUCATION OF TEACHERS FOR THE COMMUNITY SCHOOLS

(Order No. 61-3224)

Luz E. Sangalang, Ed.D.
Indiana University, 1961

Chairman: Shirley H. Engle

The study attempted to (1) determine specific areas of needs in which science education may contribute toward the improvement of living conditions in Philippine rural communities; (2) define common experiences which have potentialities for meaningful science teaching in these communities; (3) design illustrative learning experiences in science based on these needs and common experiences; and (4) draw implications for the education of teachers for the community schools.

Procedure. A checklist of rural needs, based on a comprehensive review of literature on Philippine rural life, was submitted to the directors of different agencies of the Philippine government involved in rural development, with the request that they rate the degree of importance they attributed to each need. On the basis of the results of this checklist questionnaire, the community school philosophy of education in the country, and the potentialities and resources of Philippine rural communities, criteria for the development of science learning experiences were set up. A few learning experiences were designed to illustrate how science education may minister more directly to the more urgent needs of rural life.

Findings. (1) In the area of need, the most urgent were improvement of health and increase in economic production; (2) in the area of economic production, improvement of practices in rice culture, soil conservation, and increase in meat supply were, in this order, the most significant problems; (3) in the area of rice culture, seed selection, control of insect pests, diseases and rats, and fertilization of the soil were the most urgent problems; in the area of soil conservation, the eradication of kaingin (shifting cultivation), the prevention of soil erosion, and the restoration

and maintenance of soil fertility were the most important needs; and in the area of increasing the supply of meat, poultry raising and the immunization against disease, and meet the needs disclosed in the study.
most urgent needs.

Illustrative science learning experiences. Four learning experiences in science, based on poultry raising, rice culture, conservation, and gardening, were designed to suggest approaches by which science teaching may help meet the needs disclosed in the study. Typically a learning experience revolved around experiments with controls, conducted in the school or on local farms, demonstrating the advantages of the application of scientific principles. Record-keeping was emphasized as an aid to accurate observation. Home projects and devices to secure involvement of the community were cited. The underlying principle in the conduct of the learning experiences was cooperative action of both children and adults on a significant problem of community life. Integration of the different subject-matter areas and development of the fundamental skills through the learning experience were pointed out.

Implications for teacher education. Teacher education programs must be guided by the fact that the school must act as a direct agent for desired changes. Toward this end the curriculum should include:

1. Rural sociology and economics, with a special problems approach. The teacher should be equipped with skills in obtaining basic information about rural conditions on which to develop learning experiences.
2. Experience with youth and adult community service projects involving work with rural welfare agencies and skills in group dynamics.
3. Practical experiences in conducting experiments demonstrating desirable practices in economic production and in health improvement.
4. Courses in the biological and physical sciences emphasizing the practical applications of science to common rural needs.

Microfilm $2.75; Xerox $8.60. 187 pages.

EDUCATION, THEORY AND PRACTICE

LEARNING TO USE THE SELF FOR PROFESSIONAL SERVICE: A STUDY OF TEACHERS' AND SUPERVISORS' JUDGMENTS ON SOCIAL WORK STUDENTS' PERFORMANCE IN CLASS AND FIELD WORK.

(Order No. Mic 61-2008)

Tybel Bloom, D.S.W.
University of Pennsylvania, 1960

Supervisor: Dr. Rosa Wessel

This study undertook to explicate the nature and the timing of change in the use of the self observed in the student's performance in the course of professional education for social work of one class section of (nineteen) students enrolled in the Master's Degree Program of the University of Pennsylvania School of Social Work during the two academic year period September 1956 to June 1958. The data consisted of judgments made by teachers and supervisors of student performance in class and field work which appear in the evaluation reports regularly submitted at the conclusion of each school term and are contained in the student's record. Evaluations from all curriculum areas are included. A schedule was devised defining various professional social work activities which involve the use of the self. Six of the eleven categories under which data were collected were then analyzed descriptively, according to the source of the judgment and by the time periods of the four terms. The categories were: Quality in Relationship; Capacity to Work Within a Form; Awareness; Understanding; Possession of the Self; Professional Commitment.

Grossly, it was found that both the individuality of the student and the particular time periods emerged as significant in relation to development in the professional use of the self. The uniqueness of each student was consistently and strikingly evident throughout the judgments for all four terms. A central "theme" in the student's use of himself and in his efforts to cope with problems which the use of himself presented in learning to become a social worker was clearly distinguishable in the judgments in all cases. An analysis of the data by time periods disclosed that certain broad characteristics of the student's development could be identified in the judgments for each term, and a further demarcation could be discerned between the first and the second year learning in this area. The idea was suggested that in the first year, the student's effort was directed toward becoming a professional social worker; in the second year, the student began to consider himself a "becoming" professional social worker.

If these judgments of the student's performance made by teachers and supervisors are assumed to be evidence of the student's actual growth in the use of the self, certain implications for professional education for social work may be advanced. The use of the self within professional "form" may be taught and learned without sacrificing the individuality of the student. Learning to use the self professionally appears to be a developmental process consciously effected by the student. It seems that the student recreates his own personal style into a disciplined professional form. This professional growth extends over the two year period, and occurs in relation to definite educational standards and expectations which provide the steadiness of an educational process at the same time that the discontinuity of the individual development manifests itself. The dynamic and focus for learning to use the self for professional service lie in the educational requirements, and the fulfillment inheres in the offer of professional relationships as part of the teaching method and framework.

Microfilm $4.10; Xerox $14.40. 320 pages.

EMPIRICAL RELATIONSHIPS AMONG MODES OF TESTING, MODES OF INSTRUCTION AND READING LEVELS: IN SIXTH GRADE SOCIAL STUDIES.

(Order No. 61-3632)

William Lenox Burr, Ed.D.
The Florida State University, 1961

The central purposes of this study were to determine the relationships among test scores resulting from three modes of item presentation and the influence of certain hypothesized intervening variables upon such relationships. Specifically, the modes of item presentation were (1) traditional paper and pencil, (2) paced, projected silent, and (3) paced, projected sound. The hypothesized intervening variables were mode of instruction (traditional and televised) and general academic aptitude. The relationship between reading achievement and a possible reinforcement by audio-stimulus of the visual stimulus presented by the projection of test items was also investigated.

In this study the three modes of item presentation were utilized in administering achievement tests in the social studies area to two groups of students, one group instructed by traditional methods, and one group instructed by television methods. The test scores resulting from these three administrations of tests were examined to provide information on the possible transfer of training skills from the instructional method to the testing method.

It was hypothesized that there would be no significant difference at the .05 level of significance between the mean scores of the traditionally instructed group and the television instructed group when tested with paper and pencil, projected silent and projected sound tests. Further null hypotheses were concerned with the interactions of the above variables and the rank order of scores of students with differing levels of academic aptitude. A separate investigation was made of the distribution of reading grade equivalents and signed differences between projected silent and projected sound test scores.

Television simulation was by recorder and 35mm projector. The exposure time interval of items was determined by a preliminary study. For verbal items this was 15 seconds and for graphic items 50 seconds. The analysis of verbal items was replicated for graphic items. Three forms of the Metropolitan Achievement Series, Social Studies sub-tests were used in the testing.

Fifty-three students instructed by television for fifteen months composed the experimental group. This group was matched by composite score, intelligence quotient and sex with fifty-three traditionally instructed students.

The results of the three test presentations were subjected to an analysis of variance using scaled scores. The signed difference scores from the projected silent to projected sound tests were plotted against reading grade equivalents.

The only significant effect discovered was due to fundamental differences in general academic aptitude. All other null hypotheses were accepted. Conclusions were reached that projected achievement tests, either silent or sound will produce results comparable to paper and pencil testing for either traditionally instructed groups or television instructed groups. There was no consistent difference between the performance of the two groups on verbal and graphic items.

There was no consistent difference between the performance of students on the projected silent tests and the projected sound tests. The results of the study did suggest that if audio-reinforcement does affect test performance, such effects would be found below the reading grade equivalent of 4.7 and above 8.7.

Because of the restricted coverage of this study, other studies are needed to determine:

(1) the extent to which projection methods of testing can be used in areas other than achievement.

(2) the possibility of creating new approaches to test construction that will more validly measure the outcomes of television instruction than will standardized tests, even when projected silently and with sound.

(3) the effects of home television viewing on test performance when tests are projected.

Microfilm $2.75; Xerox $3.80. 66 pages.

AN ANALYSIS OF THE RELATIONSHIP OF TEACHER CHARACTERISTICS TO THE RELATIVE SIGNIFICANCE OF TEACHING PRACTICES EMPLOYED

(Order No. 61-3185)

Robert L. Ferralasco, Ed.D.
University of Arkansas, 1961

Major Professor: Dr. R. K. Bent

I. THE PROBLEM

The purpose of this was to determine, by the use of Thompson's Scale for Evaluating the Relative Significance of Secondary School Teaching Practices, if there is a significant relationship between the relative desirability of teaching practices employed and the amount of professional training, teaching experience, sex of teachers, school size, class size, subject area taught, school rating, and teaching load.

A sub-purpose which grew out of the study, was to compare the relative desirability of teaching practices employed with these additional factors: type of school, teaching outside of teaching field, and type of teaching certificate.

II. PROCEDURE

Secondary school teachers enrolled in the College of Education at the University of Arkansas during the summer term of 1960, and who taught the previous year at the secondary level, participated in the study. These graduate students, who were asked not to identify themselves, were handed a copy of Thompson's scale and requested to check only those teaching practices they employed regularly during the past school year. The rating scale, not identified as such, used in this study did not contain the weighted values of the items because it was felt that a more objective self-appraisal would result by withholding this information.

Approximately 251 graduate students were enrolled in graduate courses in the College of Education during the summer term, and of this number, 154 were secondary

school teachers and participated in the study. Fifty-two secondary school teachers, who were enrolled for graduate credit in the science and mathematics institute, agreed to participate also.

III. FINDINGS

1. Teachers who possessed a master's degree with at least 24 hours of graduate education courses are using relatively more desirable teaching practices than teachers with the bachelor's degree and not more than 6 hours of graduate education courses.
2. Women teachers are practicing relatively more valuable teaching practices, as measured by Thompson's scale, than men.
3. English, science, and social science teachers are using significantly more desirable teaching practices than business, vocational agriculture, physical education, mathematics, and music teachers.
4. Teachers who teach 5 periods per day use significantly different teaching practices than do teachers who teach either 4 or 6 periods per day.
5. The mean scores for teachers possessing either the regular 6-year or the administrator's certificate are significantly higher than those scores of the teachers holding either the emergency or the life certificate.
6. There were no significant differences found in the relative desirability of teaching practices employed and the following factors:

   A. The amount of teaching experience.

   B. The size of the school in which the teachers taught.

   C. The average size of the classes taught by the teachers.

   D. The rating of the school in which the teachers taught.

   E. Teaching in or out of field of preparation.

   F. The type of school (6-3-3, 6-6, 8-4) in which the teachers taught.

IV. RECOMMENDATIONS

The following recommendations were offered:

1. The master's degree with emphasis on professional education courses should be the minimum requirement for certification.
2. Because of the apparent differences in the teaching practices used by teachers of the various subject matter fields, general and special methods courses should emphasize the more desirable teaching practices that are a part of every subject matter field.
3. The techniques and methods of rating schools seem open to question. Perhaps a more thorough re-evaluation of the schools already having the highest rating is needed.
4. Granting Life and Emergency certificates appears to be a very questionable practice and should be discontinued.
5. More and closer supervision of the experienced teacher to insure their continued interest and concern for the welfare of their students is indicated.

Microfilm $2.75; Xerox $5.00. 99 pages.

READING BEHAVIOR OF PUBLIC SCHOOL BRAIN INJURED AND NON-BRAIN INJURED CHILDREN OF AVERAGE AND RETARDED MENTAL DEVELOPMENT

(Order No. 61-4291)

Roger Marshall Frey, Ed.D.
University of Illinois, 1961

The purpose of this study was to compare the reading behavior of a group of brain-injured children of average and retarded mental development with that of a matched group of non-brain-injured children. The two groups of elementary school children were compared on how they performed on standardized achievement tests, diagnostic reading tests, and the type of reading errors. The experimental group had received specialized instruction intended to meet the specific educational needs of the brain-injured child.

The twenty brain-injured children were enrolled in a public school demonstration class for brain-injured children for 8 to 54 months. They were selected on the basis of their performance on psychological tests and complete medical examinations were administered to verify or negate a diagnosis of brain injury. The children in the non-brain-injured group attended regular or special classes in the same public school system and were individually matched with the brain-injured on test age equivalent (MA), CA, and IQ. The mean test age equivalent was 8-2 for the brain-injured group and 8-1 for the non-brain-injured group. The mean CA's were 10-5 for the brain-injured and 10-3 for the non-brain-injured, and the mean WISC IQ's were 78.85 (range 59-106) for the brain-injured group and 79.45 (range 58-101) for the non-brain-injured.

The following results were obtained:

1. The brain-injured group was significantly superior to the non-brain-injured group on the Gates Primary Reading Test, the Monroe Word Discrimination Test, the Gray Oral Reading Test, the Iota Word Recognition Test, and the Monroe Sound Blending Test.
2. There were no statistically significant differences between the two groups on the Monroe Word Discrimination Test, the Monroe Visual Memory Test and the Gates Reversible Words Test.
3. The ten reading error-types identified in the Monroe Diagnostic battery were used to compare the two groups on the qualitative aspects of the reading process. Compared to the brain-injured group, the non-brain-injured group showed significantly excessive errors of the following types: faulty vowels, faulty consonants, omissions of sounds, and substitution of words. No significant differences were found between the mean Z-scores of the brain-injured and non-brain-injured groups on the following error-types: reversals, addition of sounds, repetitions, addition of words, omission of words, and words aided and refused.

The result of early psychological studies in the area of perception had suggested that brain-injured children might well have difficulties in learning to read. The findings in this study indicate that they can learn to read and in some areas of reading read better than the contrast group. A number of conditions, single or in combination may have contributed to the nature of these findings. Among them are: the use of specialized teaching procedures and

the special preparation of the teachers, a public school sample, the length of the school day and the number of months the experimental group received specialized instruction, the age of the children, and the emotional support this special class provided. It appears highly plausible that the specialized educational program the brain-injured group received was the variable accounting for the better reading performance of this group.

Microfilm $2.75; Xerox $4.40. 82 pages.

SUPERVISION OF ART IN LARGE CITIES: SUPERVISORY PRACTICES FOR ART EDUCATION IN LARGE CITY SCHOOL SYSTEMS WHICH HAVE IMPLICATIONS FOR HELPING TEACHERS BECOME MORE EFFECTIVE IN THE TEACHING OF ART.

(Order No. Mic 61-2574)

Ivan Earl Johnson, Ed.D.
New York University, 1961

The purpose of the study was to determine the supervisory practices for art education large city school systems with implications for helping teachers become more effective in the teaching of art. Further, it was the purpose of this study to determine the nature and extent of use of supervisory practices in school systems of cities of more than 200,000 population; to ascertain which practices supervisors of art find most effective in improving instruction in art; to find the supervisory practices in art which teachers consider most valuable; to determine the recurring problems in the teaching of art and the practices teachers and supervisors prefer for solving them; and to project some desirable practices that have implications for helping teachers become more effective in the teaching of art.

Normative-survey research methods--questionnaires, check lists and interviews--were used in gathering the data. The four instruments used in the study were: a questionnaire to determine the importance attached to commonly reported responsibilities assumed by art supervisors; a questionnaire to ascertain the value ascribed to commonly reported practices in art supervision; a check list for determining persistent problems in the teaching of art; and a form in which selected art supervisors were asked to report for a three-month period the group practices they used for solving persistent problems in the teaching of art.

The questionnaires were sent to 15 selected directors of instruction, 68 supervisors of art, 165 art teachers and 145 classroom teachers in the 35 cooperating large city school systems. The questionnaires were tabulated and analyzed to find the value ascribed to commonly reported responsibilities and practices by those who were served by, or gave leadership to, supervision of art.

The data from the check list of recurring problems and the reports on group activities used in supervision in selected cities were analyzed in relation to the values attributed, in the questionnaires, to commonly reported responsibilities and practices to determine the relationship between prevailing practices in art supervision and the values attributed to the role and practices of the art supervisor.

The investigation revealed that the supervisor in the large city school system tends to be more insular in his specialization, is more responsible for making some, but not all, administrative decisions pertaining to budget for art materials and equipment, and functions more in an advisory capacity to the administration on matters of art and art education than a supervisor in a smaller system.

The supervisor of art is usually a member of the instructional services staff under the leadership of the director of instruction and is governed by a written statement of policy for supervision.

Because of the complexity of a large school system, the supervisor of art works with groups of teachers more than individual teachers. Group supervisory practices which were most valued by the participants were discussion groups, demonstrations, workshops, conferences in which teacher, supervisor and principal participate, workshops and group observations of a good teaching situation. Teachers, supervisors or art and directors of instruction preferred supervisory practices, where feasible, to be cooperatively planned and developed. The primary responsibility of the supervisor was believed to be that of helping teachers improve in the instruction of art. An understanding of the dynamics of human relations was considered of vital importance to art supervision.

Among the other practices valued were self-evaluation by teachers or evaluation by the supervisor of the effectiveness of the art program; recommendation for employment of new art teachers; a continuous research program in art education; planning of new art rooms; encouragement of personal creative work by teachers and supervisor; orientation sessions in art education for school administrators; and formulation of the purposes for the system's art program by cooperative action of teachers and supervisor.

On the basis of the findings of the study, it was recommended that large city school administrations study more closely the contributions art can make to the curriculum and the time and space needs which create so many problems in the instruction of art. Teacher-centered responsibility should be increased in supervisory practice. More group action is needed because of the complexity of large school systems.

Microfilm $4.60; Xerox $16.20. 357 pages.

A STUDY OF INFORMATION AND VOCABULARY ACHIEVEMENT FROM THE TEACHING OF NATURAL SCIENCE BY TELEVISION IN THE FIFTH GRADE

(Order No. 61-3356)

Mary Elizabeth Kraft, Ed.D.
Boston University School of Education, 1961

PROBLEM: This study was designed to compare the effectiveness of various methods in the use of instructional television for teaching natural science to fifth grade pupils as determined by gains in information and vocabulary achieved under the different experimental conditions.

The methods examined as to the effects on achievement in science were:

1. Preparatory training of teachers in science and television workshops as compared to no training.
2. Use of television programs to initiate or to terminate classroom instruction on a topic.
3. The use by teachers of a comprehensive study guide or a brief outline of programs in conjunction with the television series.
4. Participation by pupils through individual projects of special interest or through common class assignments.

In addition the design of the study permitted investigation of the effects of combinations of the various conditions as well as the total experimental treatment. The relationship of sex, intelligence and parental occupation to achievement was also explored as to these influences on the experiment.

PROCEDURE: Some 300 fifth grade classes from eastern Massachusetts communities were provided as an initial pool for participation in the study. From this group 90 classes were randomly chosen– 60 from towns and 30 from cities. Eighteen of the 90 classes were designated as the control group. They viewed the natural science television programs each week with a minimal follow-up period but did not experience any of the other experimental conditions. The remaining 72 classes constituted the experimental group in which 24 of the teachers received training in science teaching at the elementary level, 24 received training in the utilization of television for the elementary grades and 24 were given no special training. One half the teachers from each of the training classifications used the television programs to initiate or introduce a unit of study and the other half used the programs to terminate or conclude their teaching of a particular topic. Within each of these two divisions half the teachers were supplied with study guides for the programs; the other half directed the learning independently. Within each of these subdivisions half the teachers encouraged the children to work on individual assignments of personal interest; the remainder gave common assignments to all members of the class.

The experimental series of 30 half-hour natural science television programs, produced by the Massachusetts Audubon Society, were designed to develop understanding of the intricate relationships of all living things to their environments. These programs were telecast by WGBH-TV from October, 1959 through June, 1960.

Two tests were constructed for the study. The first was a 75 item, multiple-choice science information test (r_{11}=.86) correlated with the television programs; the second was a 150 item, matching science vocabulary test (r_{11}=.98) in which the words were identified with conceptual categories. Both tests were administered three times during the school year: September, December and May, permitting comparison of mid-year with end-of-year gains.

The main statistical technique for determining the significance of the data was analysis of variance. Two major sets of comparisons were made, the first between the experimental and control groups and the second within and between the experimental groups. For analysis of data the mean score by class not the individual score of a child was the basic unit of measurement.

FINDINGS: The major findings of this study demonstrated that:

1. All combinations of the experimental variations proved more effective than television alone (control group) as far as gains in achievement were concerned.
2. Each IQ group in the experimental classes showed a greater gain than its equivalent control group and a greater rate of gain.
3. The experimental classes showed a much greater range than the control classes in gains made.
4. Within the experimental groups, with respect to the science information test, two combinations of television and pupil assignment proved effective. Those classes whose classroom work preceded the television programs attained higher gains in science information when they were given a common assignment; those classes who did their classwork after they viewed the television programs made greater gains by individual assignments. This was true at both mid-year and end-of-year testing.
5. The gains in vocabulary were not dependent on any specific experimental treatment or combination thereof.
6. A significant relationship was found between levels of intelligence and differences in achievement. The more able groups tended to learn more science than the less academically talented in both the experimental and control classes.
7. Gains in science information and vocabulary were not related to the sex or parental occupations of the subjects.

CONCLUSIONS: A passive introduction of the television programs with cursory follow-up will not yield the learning that occurs when television lessons are supported by strong classroom activity. The task of total teaching cannot be delegated to the television teacher alone. If television is to become an integral part of elementary school instruction, the results will depend on the skill of teachers in using the programs and coordinating their efforts with them. At present children of this age level still require the personal guidance and assistance of the classroom teacher for optimal learning through this medium.

In this study students of higher ability learned significantly more than students of low ability by either arrangement of television instruction; the experimental conditions, however, proved more effective with all levels of pupil ability. Microfilm $3.70; Xerox $12.85. 285 pages.

A LONGITUDINAL STUDY OF THE EFFECTS OF ENRICHED AND ACCELERATED PROGRAMS ON ATTITUDE TOWARD AND ACHIEVEMENT IN EIGHTH GRADE MATHEMATICS AND NINTH GRADE ALGEBRA

(Order No. 61-3222)

John James Ray, Ed.D.
Indiana University, 1961

Chairman: Philip Peak

Problem

The study was concerned with securing evidence relative to the type of junior high school mathematics programs which would stimulate interest in mathematics. Evidence was also sought regarding the type of subject matter that could be successfully handled by junior high students.

Procedure

The subjects used in the study were students in the University School, Bloomington, Indiana. In the initial phase, carried on during the 1957-58 school year, four eighth grade mathematics sections were used which included: Section A, an accelerated progra, had a full year's work in arithmetic during the first semester and the first semester of ninth grade algebra during the second semester; Section B, an enriched program, devoted four days a week to classroom instruction and one day to the enriched activities which were reading days, oral reports, committee work, and films; Section C, a second enriched program, devoted four days a week to classroom instruction and one day to the enriched activities. These enriched activities included reading days, written reports, projects, field trips, and guest speakers; and Section D, the control group.

As a result of the findings and the revisions of the initial phase, four eighth grade mathematics sections were used during the 1958-59 continuation phase and the program of each section was enriched by reading days, written reports, projects, films, guest speakers, and field trips. These activities were alternated in such a way as to give the students four days of classroom instruction each week and one day devoted to the enriched activities. At the end of the 1957-58 phase, the third of the three phases began, that of a follow-up of all students in the 1957-58 study who continued to attend University School.

Conclusions

The conclusions for the first year were:

1. Students at the eighth grade level are capable of successfully handling first semester ninth grade algebra.

2. Students taking accelerated program develop greater achievement than regular students in all phases of the eighth grade mathematics with the exception of the four operations with whole numbers and linear measurement. However, on these they do just as well.

3. Students taking enriched work consisting of films, oral reports, committee days, and reading days develop greater achievement than regular students in the work concerning similar and right triangles.

4. Students taking enriched work which has committee days become more critical in the selection of students with whom they would like to work.

5. Students taking enriched work which has written reports feel they have a better chance to express their ideas in mathematics.

6. Students taking enriched work which has films do not feel that films help them develop a better understanding of mathematics.

7. Students taking enriched work which has projects do not feel they have a better chance to do independent and creative work.

8. Students taking enriched work which has oral reports feel they have a better chance to express their ideas in mathematics.

The conclusions for the second year were:

1. Students taking enriched work consisting of projects, guest speakers, field trips, written reports, and reading days develop greater achievement than regular students in work dealing with the four operations with decimal fractions, similar and right triangles, and the unit on algebra.

2. Students taking enriched work which has written reports feel they have a better chance to express their ideas in mathematics.

3. Students taking accelerated work develop greater selectivity of the ninth grade mathematics course requiring higher mathematics ability.

4. Students taking accelerated work develop greater achievement in algebra than regular ninth grade students.

5. Students taking accelerated work develop greater achievement in ninth grade algebra than students taking control program.

6. Students at the ninth grade level are capable of successfully handling tenth grade plane geometry.

Microfilm $2.75; Xerox $7.00. 148 pages.

FACTS AND CONCEPTS OF CHEMISTRY OF IMPORTANCE FOR INTRODUCTORY HIGH SCHOOL BIOLOGY

(Order No. 61-3855)

Leverne John Thelen, Ed.D.
The University of Nebraska Teachers College, 1961

Adviser: James A. Rutledge, Ph.D.

Purposes of the Study

The purpose of this study was to determine facts and concepts of chemistry of importance for the understanding of introductory high school biology. This problem was resolved into two facets: (1) to identify and state those facts and concepts of chemistry which, in the opinion of the investigator, might be necessary to understand the biological phenomena considered in certain selected typical biology curriculum materials; and (2) to determine the relative potential importance of each stated fact and concept of chemistry to the understanding of introductory high school biology.

Procedures

In the process of determining those facts and concepts of chemistry which, in the opinion of the investigator, might be necessary to understand the biological phenomena considered in certain selected typical biology curriculum materials, a selection of such materials was assembled. The curriculum materials were limited to those either specifically intended for the introductory high school biology course or which have had widespread acceptance and use by teachers of such courses. Included were textbooks, workbook-laboratory manuals, curriculum guides, films, and methods and materials books.

An analysis was made of the assembled curriculum materials to determine those facts and concepts of chemistry which might be necessary for the understanding of biological phenomena discussed or referred to therein. The facts and concepts of chemistry were listed and a precise and definite statement of each was formulated. A panel of judges was secured to act in determining the relative potential value of the stated facts and concepts of chemistry to the understanding of introductory high school biology. These judges were determined to be reasonably competent for the task on the basis of certain criteria and were so selected that a wide geographical distribution across the United States was secured.

An evaluation instrument was developed which was used to secure the opinions of the judges on the relative importance of the stated facts and concepts of chemistry to the understanding of introductory high school biology.

A tabulation was made of the judges' opinions as to how important each stated fact and concept of chemistry was to the understanding of introductory high school biology. A summation was made of the values assigned to the judges' opinions on each stated fact and concept of chemistry and a mean value calculated for each of these. On the basis of the calculated mean value, each fact or concept was designated as very important, fairly important, or of little or no importance to the understanding of introductory high school biology.

Findings and Conclusions

From the perusal of biology curriculum materials 511 facts and concepts of chemistry were identified and stated which, in the opinion of the investigator, might be necessary to understand the biological phenomena considered in certain selected typical biology curriculum materials. On the basis of the evaluations by the judges 149 facts and concepts of chemistry were designated as being very important for the understanding of introductory high school biology; 259 as being fairly important; and 103 as being of little or no importance.

Microfilm $3.25; Xerox $11.25. 249 pages.

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ENGINEERING, GENERAL

MANAGERIAL SYSTEM DESIGN

(Order No. 61-3458)

Hassan Narasimha Nanjundiah, Ph.D.
Columbia University, 1961

In any organized human endeavor, it is the sum of the contributions of all individuals that sustains the ability of the enterprise to provide the right sort of inducements to the individuals to willingly continue to contribute their best. Although each individual has a natural tendency to demand a bigger inducement in return for a smaller contribution, it is imperative that the totality of all contributions is greater than the value of all inducements for the enterprise to survive. It is known for many years that this paradox can be resolved by enhancing the value of the contributions through the beneficial effects of the power of groups and organizations on the one hand, and by offering non-economic (psychological and social) satisfactions on the other. What is, however, not available is the organizational means of ensuring that this resolution takes place at all levels in the organization.

There thus exists an organization problem. The solution which aims to cope with it needs to be such as to permit the performance of a continuing managerial task that reconciles the conflict between the individual and the organization. The design of the managerial systems of business enterprises as conceived in this dissertation provides a basis for such a solution.

Any business enterprise can be conceived as an overall system of many interrelated systems. The human organization common to all these systems can be called the managerial system of the enterprise. The behavioral analog of the attainment of the goals of the enterprise is the process by which a set of dynamically structured mutual expectations will come to be fulfilled in the given period of time. The subsets of expectations on the different entities (namely, individuals, groups and groups of groups) which constitute the human organization get fulfilled through the outcome of their respective behavior operations. Perception of expectations, decision making, and applicative actions constitute the indivisible set of sequential behavior operations which totally describes the organizational behavior of any such entity.

The behavior of each entity influences and is influenced by the behavior of several other entities. The locus of all such entities can be called its circle of interest and influence. Organization thinking and practice in terms of this circle for each entity will have a psychological advantage in that it tends to remove the traditional restrictive connotations of the concepts of authority, responsibility, accountability and control.

Of the three behavior operations common to all entities, the manner in which the decisions come to be made has the most decisive effect on the performance of the organization. To decide what to do in any given situation means choosing a personalized behavioral response to the environmental stimuli. The preferred behavioral choice of the individual cannot always be in tune with the expected behavioral choice from the viewpoint of the organization. The formal organization models derived from the concept of authority have ignored in the past such personality variables. They have accordingly proved to be inadequate for predicting organizational behavior. The necessity for incorporating these variables prompted the development of a decision-oriented preferred-behavior system model in this dissertation. It serves the purpose of conceptualizing the organizational behavior of each entity in terms of the behavior operations and of articulating their interrelationships. Mathematical notation is introduced to formulate an analytical procedure for the design of managerial systems. Finally, an algorithm-like design procedure is suggested.

The concepts of an information matrix, the relatedness of any two entities, the organizedness of a group of entities, and the behavior culture of groups of groups of entities are some of the problem areas suggested for further research. Microfilm $3.45; Xerox $12.15. 267 pages.

ENGINEERING, AERONAUTICAL

THE PLANAR INTERACTIONS BETWEEN A FULLY DEVELOPED CHANNEL FLOW AND A MAGNETIC FIELD HAVING A WEAK SPATIAL PERIODICITY

(Order No. 61-3951)

Coda H. T. Pan, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: T. Y. Li

The present work studies the steady state two dimensional channel flow of a viscous electrically conducting fluid through a magnetic field which has a spatial periodicity in the axial direction. All fluid properties are assumed to be constant.

The magnetic induction for the two dimensional case has an analog in the forced convection of heat in a laminar incompressible flow.[1] The fluid motion can be described in terms of the vorticity transfer equation, in which, in addition to the usual hydrodynamic effects, the Lorentz force has the role of generating vorticity.[2]

Linearization is achieved by assuming the Hartmann number based on the amplitude of the periodic magnetic

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field to be small. The problem is thus formulated as the interactions between a fully developed channel flow and a weak axially periodic magnetic field. The governing equations for magnetic induction and flow disturbance become uncoupled following the assumption of a small magnetic Reynolds number. Because of two dimensionality, the electric field is constant and gives rise to a pressure disturbance but has no consequence on the flow field. Depending on whether the applied magnetic field has a strong uniform component, the mechanism and results of the interactions are vastly different. These two cases are treated separately.

For the case that the applied magnetic field does not have a uniform transverse component, the basic flow is that of Poiseuille. Uncoupling of magnetic induction from flow disturbance does not depend on the assumption of a small magnetic Reynolds number, which nevertheless permits a closed form solution of the induced magnetic field and greatly simplifies the solution of flow disturbance. The Lorentz force has a quadratic dependence on the applied magnetic field, consequently the flow disturbance consists of one part which is axially uniform and another part which is axially periodic with a spatial frequency twice that of the applied magnetic field. The pertinent parameters are the magnetic Reynolds number, the Hartmann number, the wave number, and the Reynolds number. In the limiting case of a vanishingly small wave number, the results of a Hartmann flow with a weak magnetic field are recovered. For a large wave number, the principal length scale is the wave length.

For the case that the transverse component of the applied magnetic field has a strong uniform part, the basic flow is that of Hartmann. The uniform part of the applied magnetic field interacts with the perturbation velocity to produce a first order effect on the induced current, which in turn adds to the first order Lorentz force. In this manner, the uniform magnetic field introduces a feedback term to the flow disturbance. Another feature due to the strong uniform magnetic field is a "hydromagnetic boundary layer" behavior in the flow disturbance for all Reynolds numbers. The "hydromagnetic boundary layer" has a thickness of the order of the reciprocal of the Hartmann number.

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1. Leigh, D. C. and Sutton, G. W., Journal of the Aero/Space Sciences, 27, No. 6, p. 469, June 1960.
2. Cole, G. H. A., Advances in Physics, 5, p. 452, 1956.

Microfilm $2.75; Xerox $6.00. 123 pages.

LINEARIZED DISSOCIATING GAS FLOWS

(Order No. 61-3957)

Kuo Chang Wang, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Dr. T. Y. Li

The system of equations for an inviscid diatomic dissociating gas flow differs from that of the conventional case only in the state equations and the rate equation. For small disturbances, the flow is described by a single linear partial differential equation of third order in term of the perturbed potential ϕ

$$\tilde{\tau}\left(\frac{\partial}{\partial t}+\bar{u}_\infty\frac{\partial}{\partial x}\right)\left\{\frac{\partial^2\phi}{\partial t^2}+2\bar{u}_\infty\frac{\partial^2\phi}{\partial x\partial t}-a^2_{f_\infty}\left[\left(1-\frac{\bar{u}^2_\infty}{a^2_{f_\infty}}\right)\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}+\frac{\partial^2\phi}{\partial z^2}\right]\right\}$$

$$+\left\{\frac{\partial^2\phi}{\partial t^2}+2\bar{u}_\infty\frac{\partial^2\phi}{\partial x\partial t}-a^2_{e_\infty}\left[\left(1-\frac{\bar{u}^2_\infty}{a^2_{p_{-\infty}}}\right)\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}+\frac{\partial^2\phi}{\partial z^2}\right]\right\}=0$$

where $\tilde{\tau}$ denotes the relaxation time, while a_{e_∞} and a_{f_∞} are respectively the equilibrium and frozen speed of sound.

Nonequilibrium dissociation is by definition irreversible. However, the increase of entropy of a flow particle is of higher order of magnitude. To the linear approximation, the flow is therefore still isentropic. The effect of nonequilibrium dissociation in a linearized flow is dispersive rather than dissipative.

The above linearized equation has been applied to two problems in this thesis: one for a three-dimensional steady flow, one for a two-dimensional unsteady flow.

The steady problem concerns a flow over slender pointed bodies of general cross section. It is an extension of the classical work of Ward to include the dissociation effects. The transform methods are used to obtain the solution, both supersonic and subsonic cases are considered. The order of magnitude of various terms are first shown to remain unchanged, the pressure and density relations are proved to take the same form as usual. It follows then that the expressions for the lateral forces, moments and drag deduced by Ward form general momentum theory apply equally well to the present dissociating flow.

For the equilibrium and frozen cases, the lateral forces, moments, and drag are found to be identical to those for the conventional case, provided that the rear end of the body is either pointed or has a cylindrical form. For the nonequilibrium case, the lateral forces and moments are still not affected by dissociation, but there exist additional nonequilibrium terms in the drag expression. Their net contribution may represent drag or thrust depending on the body's shape and the Mach number. If the body is pointed at both ends, there is left only one nonequilibrium term which will be a drag in the supersonic case if it is a thrust in the subsonic case and vice versa.

The unsteady problem is concerned with the stability of a vortex sheet in dissociating gas flows. Two parallel streams are taken to be moving with uniform velocity U_1 and U_2 in the upper and lower half planes. The vortex sheet is initially straight and then affected by small periodic disturbances. The same problem in the conventional case was considered by Holmholtz, Landau and others. Up to date, little has been known about the dissociation effects on the hydrodynamic stability. The present study is believed to be the first one in that direction.

For the equilibrium and frozen cases, the eigenvalue equation is found to be identical in form with that of the conventional case. The dissociation effects enter only through the change of the sound velocity and the specific

heat ratio. The region of stability is shown to be slightly reduced when dissociation is taken into account. For the nonequilibrium case, the eigenvalue equation is complex, and depends on the wave number. Even for the neutral supersonic disturbances, the eigenvalues, if any, are still discrete. The determination of neutral curve is first discussed and the vortex sheet is then shown to be always unstable. Microfilm $2.75; Xerox $4.00. 73 pages.

ENGINEERING, CHEMICAL

ROLE OF CRYSTAL AND GLASS PHASE IN DEFORMATION AT HIGH TEMPERATURE

(Order No. 61-4182)

Ung Up Chi, Ph.D.
Rutgers University, 1961

Two idealized models, representing two different kinds of actual ceramics of glass-bonded type, are established logically with the object of simplifying testing systems by probable elimination of non-rheological effects on dimensional changes of the specimen under stress at high temperature. The model A consists of crystalline particles dispersed in a continuous glass matrix. The model B does not contain a sufficient amount of glass to form a continuous matrix.

Two models are prepared by hot-pressing mixtures of a calcined alumina and Na_2O-CaO-B_2O_3-SiO_2 glass. X-ray diffraction patterns and microscopic examinations show that there has been no significant formation of new phases or grain growth during the hot-pressing and long stress test.

Specimens are subjected to the bending test with two equal loads applied at the same distance from each end. The test temperature and total load range 580° to 640°C and 1,000 to 8,000 gm respectively. Approximately 7 days are necessary to observe the steady deflection rate, and it also takes about 7 days to complete a recovery test.

The deflection and recovery process in each test on the model A can be empirically expressed as a function of time by the relation, $y = C_1 + C_2(1 - e^{-kt}) + C_3t$, where y is the total deflection or recovery at a time t. The first term on the right hand side of the equation represents the instantaneous deflection or recovery, the second term the delayed, and the third term the steady. The relation between the non-recoverable deflection and load suggests existence of a yield stress in the flow of model A.

There are two stages in the deflection process of the model B. After an instantaneous deflection, the deflection rate decreases gradually with time. And at a certain time the deflection rate increases suddenly, then it decreases again with time. The deflection taking place before the time of this sudden increase is called the first-stage, and the deflection taking place after this time is called the second-stage. The study on the non-recoverable deflection with regard to the load suggests that there are yield stresses in both the first- and second-stage deformation.

Analyzing the deflection and recovery data obtained it is possible to construct the rheological tree for each model. The deformation of model A can be represented by series coupling of Bingham and Kelvin body. The first-stage deformation of model B can be represented by the same rheological tree as model A, and the second-stage deformation can be represented by the tree, (Newtonian / St. Venant) - Kelvin. The rheological equation for each model can be derived on the basis of the rheological tree constructed. Rheological constants are determined from observed data of deflection and recovery.

The theoretical curvatures of model A at 600°C under 2,000 gm are calculated by examining the stress variance in a cross section of the beam with deflection. These calculations are carried out step by step with a short time interval Δt on the basis of the rheological tree and constants obtained. Thus calculated curvatures are compared with observed values to examine whether the constructed rheological tree and determined constants explain deformation behaviors of model A properly or do not.

The plastic viscosities of model A and B are discussed by comparing them with that of the pure glass used as a raw material.

Microfilm $2.75; Xerox $9.45. 208 pages.

LIQUID-LIQUID EXTRACTION EFFICIENCIES OF A PULSED PACKED COLUMN AND A PULSED SIEVE-PLATE COLUMN OF FOUR-INCH DIAMETERS

(Order No. 61-4883)

Craig Mitchell Christensen, Ph.D.
Cornell University, 1961

The effectiveness of pulsation as a means of increasing liquid-liquid extraction efficiencies was compared for a pulsed packed column and a pulsed sieve-plate column each 4 inches in diameter. The packings used were 1/2-inch Raschig rings and 1/2-inch and 1-inch Intalox saddles. The plate spacings used were 1/2-, 1-, and 2-inch. The plates were perforated with 3/32-inch holes which provided 25% free area.

Pulsation was supplied by a positive displacement piston pump at amplitudes in the column from 1/16 to 1 inch at frequencies from 29 to 400 rpm. The system water-acetic acid-methyl isobutyl ketone was used with the organic phase dispersed.

Data for the pulsed packed and pulsed sieve-plate columns at equal flow rates are presented graphically by means of contour lines of constant HETS values on a log-log plot of pulse amplitude vs. frequency. Over wide ranges of amplitude and frequency, the HETS contour lines are not parallel to the lines of constant amplitude-frequency-product. This, in itself, clarifies (without resort to experimental error) the broad band of values obtained by plotting HETS vs. amplitude-frequency-product as many investigators have done.

In the region of high pulsation at low flow rates, it was found that the pulse action orients the packing which reduces the capacity but increases the efficiency for 1/2-inch Raschig rings. Under the same operating conditions, 1/2-inch plate spacing gives the highest efficiency with a capacity as great as that for larger spacings.

The best efficiencies for both columns were obtained

with total flow rates of about 60 ft.^{3}/hr.ft.^{2} in the "emulsion region" of operation at high frequencies and low amplitudes. Minimum HETS was 2.5 inches for the pulsed sieve-plate column, and 4 inches for the pulsed packed column. In over-all performance, the pulsed packed column and the pulsed sieve-plate column are equally satisfactory. Microfilm $2.75; Xerox $9.45. 210 pages.

THE RATE OF VAPORIZATION OF WATER, ICE, AND METHANOL.

(Order No. 61-3497)

Lawrence John Delaney, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Lee C. Eagleton

The condensation coefficient has been investigated extensively since the early work of Knudsen (1) and Langmuir (2). The major portion of the work was originally done on the gas-solid systems and this led to a detailed picture of the process of crystal growth. The work of Alty (3) represented the first accurate work on low boiling liquids such as carbon tetrachloride and water. This work indicated that water vaporized at only 4% of its theoretical maximum value while carbon tetrachloride vaporized at its maximum rate. Subsequent work on many liquids, both high and low boiling, reinforced the conclusions of Alty, namely, that associated or highly polar liquids exhibited a low condensation coefficient while the non-polar, or molecular, liquids vaporized at their maximum rate. The attempt to characterize the condensation coefficient on the basis of a structural model has been retarded partly because of the difficulty in describing liquids theoretically and partly because the experimental data were both scarce and sometimes contradictory.

The theoretical work of Baranaev (4) on the connection of α to the energy of a molecule passing from liquid to vapor has received little attention since it was proposed in 1939. The second major attempt to calculate α theoretically was the recent work of Mortensen and Eyring (5) who combined the transition state theory and free volume theory to calculate the free angle ratio at various temperatures for fourteen liquids. Wyllie (6) suggested that the free angle ratio was equal to the condensation coefficient and this correspondence was verified at low temperatures. However, there has been no systematic investigation of the variation of the condensation coefficient with temperature and in many instances, the theoretical comparisons were made on the basis of one reported work (4).

It was decided to measure the condensation coefficient of water at two distinct temperatures using the technique of evaporation in a closed system and to record continuously the temperature signal from a thermistor and the pressure signal from an alphatron vacuum gauge. Table IX lists the results obtained in this work. These are the first results obtained for water, ice, and methanol in a closed system using continuous readings of the temperature and pressure.

The results obtained for water were combined with the previous results of Alty and Mackay (7) at 15°C and Prüger (8) at 100°C and the variation of α over its normal liquid range was obtained. It was found that α varied exponentially with temperature according to the relation:

$$\alpha = 0.0025\ e^{+1,523/RT} \qquad (6)$$

TABLE IX. COMBINED EXPERIMENTAL RESULTS.

Substance	Temperature	Condensation Coefficient
Water	0°C	0.0415 ± 0.0036
Water	43°C	0.0265 ± 0.0031
Ice	-12°C to -2°C	0.0144 ± 0.0020
Methanol	7°C	0.0171 ± 0.0022

The comparison of the experimental results with the theory of Mortensen and Eyring (9) showed that the values agreed near room temperature but that the temperature variation of α was opposite to that measured experimentally. The condensation coefficient was discussed in terms of the ratio of the rate of rotation of the water molecules in the liquid to the rate of impingement of vapor molecules on the liquid surface. The calculated condensation coefficients for water were 0.0275 at 0°C and 0.0263 at 100°C.

The experimental results for ice near fusion gave a value of $\alpha = 0.0144$ which is strikingly different from the previously reported values of unity in the temperature range -85°C to -40°C. The condensation coefficient for methanol was measured to be $\alpha = 0.0171$. This value was compared to the experimental value of 0.045 which was obtained by Baranaev.

1. It was concluded that the theoretical work of Mortensen and Eyring does not adequately describe the experimental variation of the condensation coefficient of water with temperature.
2. It was concluded that it was possible to view the condensation coefficient as the ratio of the rate of rotation of water molecules in the liquid surface to the rate of arrival of vapor molecules at the surface. This conclusion is subject to the usual uncertainties in the estimate of liquid properties.
3. It was shown that ice near its fusion point vaporizes at only 1.44% of its maximum rate.
4. It was shown that the technique of vaporization in a closed system may be used for a variety of substances over a range of temperatures.

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Microfilm $2.75; Xerox $4.20. 79 pages.

THE STEREOSPECIFIC POLYMERIZATION OF 1-PENTENE

(Order No. Mic 61-2749)

John Battista Gallini, Ph.D.
University of Michigan, 1961

A study has been made of the polymerization of 1-pentene using a titanium trichloride-triethylaluminum catalyst and n-heptane as the solvent. The polymerizations were run in glass reaction vessels at pressures near atmospheric and over a temperature range from 0° to 85°C. The monomer concentration was varied from 5 to 95 volume per cent; the titanium trichloride concentration was varied from 5 to 50 grams per liter; and the triethylaluminum concentration was varied from 0.4 to 12 moles per liter. The rate of polymerization, intrinsic viscosity, and polymer density were each measured as a function of these reaction conditions.

The rate of polymerization was found to be first order with respect to monomer concentration and titanium trichloride concentration and independent of the aluminum alkyl concentration. The temperature dependence of the rate was found to be of the Arrhenius form with an activation energy of 7.5 kcal/mol. It was found also that the specific rates for two different grades of titanium trichloride were not directly proportional to the specific surface area of the titanium trichloride as measured by nitrogen adsorption. At higher temperatures the catalyst activity was found to decrease with time according to a process which appeared to be first order with respect to the titanium trichloride concentration.

The intrinsic viscosity of the polymer was found to increase with increasing monomer concentration, to decrease with increasing aluminum alkyl concentration, to be independent of the titanium trichloride concentration, and to decrease with increasing temperature. In order to correlate these molecular weight data satisfactorily with these reaction variables it was necessary to assume an empirical relationship between the intrinsic viscosity and the number average degree of polymerization. This relationship indicated that the ratio of viscosity average to number average molecular weight increased with increasing molecular weight. Some support for this empirical form was obtained from a few osmotic pressure determinations.

Little variation in polymer density was observed with reaction conditions. However, the nature of the catalyst used did affect the density.

These results have been interpreted according to the mechanism proposed by Natta and others whereby the aluminum alkyl is strongly adsorbed on the surface of the titanium trichloride forming an active catalyst site. The polymer grows out from this site with each addition of monomer occurring at the same site. Termination of the growth of the polymer molecule can occur by several processes; (a) spontaneous monomolecular termination; (b) transfer with monomer; and (c) transfer with the aluminum alkyl. Activation energies for each of these processes were calculated.

Microfilm $2.75; Xerox $8.80. 191 pages.

THE KINETICS OF NICKEL CARBONYL FORMATION

(Order No. 61-3763)

William Morgan Goldberger, D.Ch.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Donald F. Othmer

Recent developments indicate a growing use of nickel carbonyl, not only in the field of nickel metallurgy but also in other areas. The compound is formed by the reaction of carbon monoxide with metallic nickel. Although the formation reaction has been important in the extractive metallurgy of nickel, the literature contains very little information relating to the kinetics. It was the purpose of this study to examine the variables effecting the reaction rate and to determine the rate controlling factors.

Experimentally, reactions were conducted in a differential flow reactor by passing purified carbon monoxide through a bed of freshly reduced nickel powder. Active nickel powders were prepared by decomposition of nickel oxalate under dry hydrogen at 400°C. It was found that powders of reproducible activity could be obtained when the nickel oxalate was dispersed with silica to reduce sintering. Kinetic data were determined at 26°C to 149°C and at pressures from 1 to 4 atmospheres. Gas velocities of from 1.172 to 1.925 cm/sec. were used.

The extent of nickel conversion and the conversion rate were influenced by the temperature and pressure but not by the gas velocity. The maximum rate of reaction and the maximum conversion occurred at about 75°C at each pressure studied. In addition, the rate and the conversion were substantially increased at higher pressure.

The effect of pressure on the rate was due primarily to the changes in the thermodynamic driving force. To a lesser degree, higher rates and conversions at elevated pressure were believed to be caused by greater adsorption of reactant gas.

The experimental data was found to agree with a mechanism which considered the combination of gas adsorption and surface reaction to control. It was concluded that diffusional effects were not a significant factor in rate control. The large pressure influence and the fact that the over-all rate went through a maximum with increasing temperature did not indicate a diffusion mechanism. The activation energy of 7,240 cals./g.-mol, calculated from the data, was also higher than that expected for a diffusional process.

The data was correlated over the experimental range by use of a pseudo-first order rate expression. The equation included terms to account for the effect of temperature and pressure on the thermodynamics and the solid activity.

Microfilm $2.75; Xerox $7.00. 149 pages.

THE USE OF EQUATION OF STATE FOR PREDICTION OF VAPOR-LIQUID EQUILIBRIA

(Order No. 61-3764)

Min-Shuey Lin, D.Ch.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Leonard M. Naphtali

The use of BWR equation of state to predict thermodynamic properties such as K-factor (or vapor/liquid equilibria) of a mixture has been proven in the literature to be successful for the systems consisting of purely light hydrocarbons at moderate temperature and pressure range, and one system other than hydrocarbon – nitrogen-carbon monoxide, but failed when applied to the other systems. The work in this study has been devoted to find out the real cause of the failure in the previous works, whether it is due to the form of the equation itself or due to the method of deducing the equation of state of the mixture from the equations of its constituents.

The basic problem was found to be that the BWR equation cannot represent the behavior of the pure component over the wide temperature and pressure ranges as required in the K-factor prediction. Ignoring this requirement, adjusting the interaction constants alone (even all 12 interaction constants in the case of binary mixtures) will not reduce the deviation appreciably.

The BWR equation has been modified to extend the coverage. The method of non-linear estimation has been found to be versatile in constants determination (either from PVT or vapor pressure data). When using PVT data to determine the constants, pressure, instead of compressibility factor, should be used as the dependent variable.

In general, two sets of constants are required for each component to represent the system behavior more fully, one from PVT data, the other from vapor pressure data. For the purpose of predicting the K-factor, in most cases the constants from PVT data can be used with reasonable results. Only when the reduced temperature is lower than 0.7 and the pressure is close to the vapor pressure of the pure component, the constants from vapor pressure are needed for that component. The "prediction" of the K-factors of binary systems (nitrogen-methane and methane-, propane-, n-butane-carbon dioxide) with reasonable results are shown.

Possible ways of further improving the equation of state have been suggested. The ultimate goal of the improvement is to get a form of equation which will require only one set of constants to represent the behavior of the system fully.

The IBM 704 computer has been employed in the computation. The required programs for the computation have been developed and can be used for the anticipated future work with minor alterations.

Microfilm $3.40; Xerox $11.95. 262 pages.

CALCULATION OF VAPOR-LIQUID EQUILIBRIUM FROM VAPOR PRESSURE MEASUREMENTS: THE SYSTEM ETHANOL-TOLUENE.

(Order No. 61-3947)

James John Ljunglin, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: H. C. Van Ness

Because the demand for vapor-liquid equilibrium data grows apace, a quick, simple way of obtaining them is greatly to be desired. Attempts to eliminate some of the more time-consuming and complicated procedures associated with equilibrium stills having failed, it is proposed that the key to the more routine method sought lies in the calculational methods which allow the resolution of total pressures into partial pressures by thermodynamic analysis.

It is felt that the possible reason for these long-known methods' failure to gain the acceptance which their advantages might bring them has been the lack of rigor in their derivation and the consequent uncertainty in their results. Complete derivations with emphasis on the results of approximation are, therefore, presented.

Of the methods known, integration of the rigorous coexistence equation is considered most suitable. This method was applied to vapor pressure measurements made on the non-ideal ethanol-toluene system at temperatures between 25° and 70°C. The vapor pressure determinations were made in a small, portable cell equipped with a pressure transducer as measuring device. It was thus convenient to weigh the cell and its contents in order to prepare solutions of known composition thereby eliminating analysis steps. The major difficulty, that of completely degassing the samples, appears to have been overcome since the results of the vapor pressure determinations compare favorably with accepted literature values.

A program to integrate the governing equation numerically was written for the IBM 650 system. The calculation was thus quick and routine. The resultant equilibria are presented at 35°, 45°, 55°, and 65°C and at 200, 400, and 756 mm Hg. The calculated values compare well with the best literature data.

With the proper information available, e.g., virial coefficients, the computation can be carried out with complete rigor. This was done for a sample case and quantitative estimates of the errors introduced by certain simplifications for convenience were obtained. For the case considered these were all small.

It is concluded that a method which shifts much of the labor to a computer leaving to the experimenter fairly effortless duties which result in large quantities of equilibrium data is attainable with the proposed method.

Microfilm $2.75; Xerox $5.60. 112 pages.

THE OXIDATION OF PARA CYMENE

(Order No. 61-3765)

George Mayurnik, D.Ch.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Donald F. Othmer

The object of this research was to study the mechanisms and kinetics of the autoxidation of para cymene to its hydroperoxides.

Under conditions of thorough oxygen saturation, the rate controlling mechanism was shown to be the abstraction of a hydrogen from para cymene by a peroxy radical to form the hydroperoxide molecule and a cymyl radical. The reaction between oxygen and a cymyl radical to form a peroxy radical is enormously faster than the rate controlling mechanisms.

The principal chain terminating mechanism involves collision between peroxy radicals to form non-radical products. The main source of free radicals arises from the thermal decomposition of hydroperoxide.

The following rate equation was developed which describes the rate of hydroperoxide formation during the propagation phase of the reaction:

$$d(ROOH)/dt = ks'^{0.5}(ROOH)^{0.5}(RH)^2 - s'(ROOH)(RH)^2$$

Rate constants at five temperatures between 105°C. and 125°C. were obtained from experimental data. The concentration of the product appears as both a positive and a negative factor in the rate equation. To the extent that the hydroperoxide product acts as a catalyst and inhibitor, this equation is in agreement with experimental evidence.

A study of catalysis led to the discovery that a dual catalyst system consisting of platinum and pyridine or palladium and pyridine accelerates the formation of hydroperoxide more than the individual catalysts. Reaction mechanisms were proposed to explain the action of these catalysts. Platinum and palladium are believed to adsorb oxygen to form an activated complex which is subsequently reduced by the substrate to form free radicals. Pyridine is believed to react with hydroperoxides to form a salt which on dissociation gives unstable intermediates which break down to yield free radicals.

Numerous single, dual, and multiple catalyst systems were studied and the results are discussed.

An expression for the rate of hydroperoxide formation was developed for the platinum-pyridine catalyzed autoxidation of para cymene.

Microfilm $2.75; Xerox $9.45. 210 pages.

A STUDY ON ITERATIVE OPTIMIZATION AND ON THE DESIGN OF PROCESSES SUBJECT TO RANDOM FAILURES

(Order No. 61-3703)

Dale Frederick Rudd, Ph.D.
University of Minnesota, 1960

This work is divided into two major parts. In the first part an evolutionary operation method called iterative optimization is developed. This method uses a digital computer system to analyse the performance of a complex process, obtaining enough information to improve the process's performance. The novel features of this method are that no a priori information concerning the nature of the process is necessary and no steady state experiments with the process are needed. The information needed for optimization is extracted from the process's normal operating data. Two applications are considered in which the method, used by a digital computer, improves the performance of simulated processes.

The second part deals with the design of stagewise chemical processes that are subject to random failures. This work presents a design technique, based on probability, and dynamic programming concepts, that minimizes the adverse effects of random batch failures in certain classes of stagewise batch reaction processes. The design examples included show how, by the proper design, such processes can be made more profitable.

Microfilm $2.75; Xerox $5.40. 106 pages.

THE EFFECT OF AXIAL MIXING ON A TUBULAR CHEMICAL REACTOR

(Order No. 61-3560)

Jordan L. Spencer, Ph.D.
University of Pennsylvania, 1961

Supervisor: W. C. Cohen

The effect of axial mixing on an empty tubular chemical reactor was studied theoretically and experimentally in order to examine the mixing effect and to test and compare two models that have been proposed to account for it. These models are, first, the finite stage model, in which the reactor is treated as a series of well-stirred tanks; and second, the diffusion equation model, in which the mixing mechanism is assumed to be diffusive and the reactor as a whole is described by differential equations.

The liquid-phase reaction between sodium thiosulfate and hydrogen peroxide was selected to be used in the experimental work. This exothermic reaction was carried out in an adiabatic well-stirred calorimeter and the temperature recorded; from the resulting curves of temperature as a function of time the stoichiometry and order of the reaction were determined and the heat of reaction, energy of activation and rate constant calculated.

The tubular reactor used was composed of a stationary outer cylinder and a rotating inner cylinder; the turbulent flow in the annulus resulted in a strong axial mixing and essentially perfect radial mixing. Thus radial gradients were neglected and the reactor treated as one dimensional. The axial diffusion coefficient was measured by a frequency response technique using an inert tracer.

The partial differential equations corresponding to the transient reactor behavior were solved by an implicit numerical method. Most of the solutions presented are for the steady-state; in this case a large time increment was used to accelerate convergence.

A series of solutions was obtained in which the degree of axial mixing varied from no mixing to perfect mixing, and the effect of axial mixing was thus illustrated. It was

shown that the finite stage model and the diffusion equation model are equivalent over a wide range, but differ where the axial mixing is very strong. It was found that the conversion was maximized for an intermediate degree of axial mixing.

Comparison of theoretical and experimental temperature profiles showed good agreement, indicating that the diffusion equation model is capable of accurately predicting the effect of mixing.

Microfilm $2.75; Xerox $7.40. 157 pages.

THE ROLE OF THE INTERFACE IN LIQUID-LIQUID MASS TRANSFER. (TRANSFER OF ACETIC ACID ACROSS WATER-BENZENE INTERFACE.)

(Order No. 61-3564)

Stanislaw John Szpak, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. A. Norman Hixson

Current experimental research in the field of interfacial mass transfer, particularly in the field of liquid-liquid extraction, suggests that the regime of applicability of the film concept is limited indeed. Interfacial instability resulting in an eruptive type of transfer, observed and confirmed by many workers, is but one piece of evidence that casts doubt on the validity of the classical film theory.

The main objective of this work was to examine one of the fundamental aspects of interfacial mass transfer, i.e., the role of the interface during the transfer of solute. A system, water-benzene with acetic acid as the transferable substance, was selected, and the solute (acetic acid) was allowed to migrate by molecular diffusion to the water-benzene interface from a plane of constant concentration. The behavior of the interface was then inferred from the time-space distribution of the diffusing substance, particularly in the vicinity (up to within 0.2 cm) of the interface. The interferometric method was adopted for the continuous recording of the solute transport.

The analysis of the interference pattern showed that the rate of transfer (expressed as a ratio of an arbitrary selected unit of transfer) varied in an irregular manner that cannot be explained by any of the classical concepts. Repeated experiments showed that one can distinguish three periods: a period of rapid and large changes in the amount of material transferred, followed by a period in which a decrease in magnitude and frequency takes place, and finally, a period of more or less uniform rate of transfer slowly diminishing with time. However, as one changes the value of the surface tension either by initial distribution of solute or by the addition of surface-active agent, the previously described periods were less distinct in the former, and indistinguishable in the latter case.

Measurements of the apparent diffusion coefficient in the vicinity of the interface showed a variation of two orders of magnitude (from 1.4×10^{-7} to 1.6×10^{-5} cm^2 sec^{-1}) too large to be explained in terms of concentration dependence. Furthermore, the plot of lines of equal diffusivity as a function of time and distance from the interface, and a plot of diffusion coefficient as a function of position indicate clearly that the interface acts as a "pump" producing slower and faster transport. The values of the coefficient of "convective flux" due to the transport of solute in the field force (derived from Smoluchowski's interpretation of the diffusion equation) were determined experimentally. The results confirmed that the role of surface activity is in both promotion and retardation of mass transfer.

It was shown that influx of the solute molecules into the interfacial region lowers the value of its potential energy more, the larger the interaction between the entering molecules and the molecules residing in the interfacial region; conversely, the efflux of molecules increases its potential energy, thus giving rise to irregular diffusional transfer, or in extreme cases, to mechanical instability in the form of eruptions.

The changes in the interfacial energy suggest that the mass transfer can be described in terms of a rate equation. An appropriate rate equation was derived following Volmer's approach which implies that: (i) at small deviations from the equilibrium value, the rate of transfer is proportional to the deviation, whereas at larger deviations it is an exponential function of the deviation; (ii) at the very beginning of transfer large fluctuations in rate slowly diminishing with time should be expected; and (iii) the addition of surface-active agents tend to increase the rate (the work of surface formation is diminished); however, the increased stability of the interface may decrease the transfer under operating conditions, i.e., in an extraction column. Microfilm $2.85; Xerox $9.90. 217 pages.

THE IRREVERSIBLE EMBRITTLEMENT OF STEEL BY HYDROGEN AT HIGH PRESSURE AND HIGH TEMPERATURE

(Order No. 61-3567)

John Robert Thygeson, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Melvin C. Molstad

The effect of hydrogen at high pressure and temperature on steel was investigated at 400°C and 500°C and 1000 atmospheres. A systematic study was made of the rate of decarburization at these conditions.

The steels investigated were a high carbon steel, C-1095; a low carbon steel, C-1010; a 2% chromium, molybdenum steel; a 5% chromium, molybdenum steel; and three super alloys–A-286, 16-25-6, and 19-9DL. The method of exposure of the specimen to the high pressure hydrogen was similar to that used by Dodge. This utilized a tensile test specimen in the form of a miniature pressure vessel, thereby simulating the conditions normally encountered in plant-scale equipment in contact with high pressure hydrogen. The experimental apparatus was designed to test simultaneously 36 tensile specimens. Additional specimens were tested in the unstressed state.

The effect of hydrogen on the specimens was measured in terms of 1) the mechanical properties as obtained from the tensile test, 2) the permanent expansion of the specimen, and 3) the reduction in carbon content. Metallographic examination of the microstructure was also made

in order to relate the structural damage to changes in the mechanical properties and carbon content of the specimen.

The decarburizing process in carbon steel was characterized by an initial temperature dependent incubation period during which no apparent changes were observed in the mechanical properties and microstructure of the specimen. This was followed by a period of relatively rapid decarburization accompanied by pronounced grain boundary expansion. The final stage of the process was described by a comparatively slow rate of decarburization. The influence of temperature, pressure, heat-treatment, stress, and chromium content on the rate of the process was determined.

Results obtained on the long time exposure of high alloy steel extended the range of the available data on these steels in contact with high pressure hydrogen. The effect of chromium on the resistance of alloy steel to hydrogen attack was determined for medium alloy steel. Super alloy steel was shown to be slightly attacked by high temperature, high pressure hydrogen after an exposure time of 7000 hours. This had not been previously reported in the literature. The distinguishing feature of the effect of hydrogen on these steels was the prolonged incubation period, which seemed to be greatly influenced by the chromium content of the alloy.

Microfilm $2.75; Xerox $5.80. 117 pages.

ENGINEERING, CIVIL

THE APPLICATION OF PEDOLOGY TO HIGHWAY ENGINEERING IN WISCONSIN

(Order No. 61-3123)

Robert Henderson Keyser, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Lloyd F. Rader

The Application of Pedology to Highway Engineering in Wisconsin developed into the following closely interrelated problems:

(1) The development of procedures and solutions to highway engineering problems, utilizing principles and data of both pedology and soils engineering and,

(2) The development of principles and formulae relating the design of flexible pavements to the many variables associated with Wisconsin soil conditions and climate.

Approximately 360 Wisconsin Pedological soil series are grouped under 124 major series units which are based on the relationships of their engineering properties, drainage, topographic and geologic features, pedological classification units, and engineering uses. The relationships were established by field investigations as well as laboratory test results on approximately 420 soil samples.

Theoretical and empirical concepts of flexible pavement design were utilized to develop a family of pavement design curves. The validation of the semi-empirical curves was checked by field investigations of pavement performance which attempted to relate pavement composition, thickness, and traffic volumes to subgrade conditions. Approximately 175 subgrade soil samples were tested to aid in the analysis of the subgrade conditions.

The Pedological soil series descriptions have been rewritten to stress the engineering aspects of each series. A brief discussion is included for such items as: marsh genesis, morphology, and treatments; flexible pavement design; soil surveys; pedology; drainage; frost; maintenance; construction; and methods for adapting pedology to highway engineering.

A family of flexible pavement design curves has been developed to relate total pavement thickness, commercial vehicles, and subgrade conditions.

Based on tests on many soil samples from different locations, on field investigations, and on the sciences of Pedology and Soils Engineering, recommendations for solutions to highway engineering soil problems are summarized in tables and figures.

Flexible pavement design curves have been developed indicating effects of commercial traffic, soil series, and climatic influences. The curves are developed from data obtained from theoretical and practical concepts of pavement design, and from field investigations of pavement performance.

Microfilm $3.90; Xerox $13.75. 304 pages.

A STUDY OF OXIDATION-REDUCTION POTENTIALS APPLIED TO SEWAGE SLUDGE DIGESTION

(Order No. Mic 61-2776)

Alan Hartley Molof, Ph.D.
University of Michigan, 1961

In recent years, economic pressures have resulted in higher and higher loadings on sewage sludge digestion processes. The processes in turn have reflected the loads imposed upon them by becoming more and more sensitive to environmental changes. It is therefore important to increase the store of fundamental knowledge which is presently available to engineers regarding the anaerobic digestion of sewage sludge. The purpose of this study is to define the relationship between oxidation-reduction potential measurements and other basic parameters in this basic biological process.

The experimental studies are conducted with gold and platinum electrodes. Data are presented on the quinhydrone, lactose broth-sewage sludge, and sewage sludge systems. A comprehensive literature survey is reported on the effect of cleaning methods on the metal electrode and the effect of gases on the electrode potential.

The determination of the sludge potential appears to be dependent on many factors: time, type of electrode, electrode history, and the technique of measurement. The results indicate that the time necessary for an electrode to reach equilibrium can vary from 10 to 50 hours. This time can be reduced by agitation and by preconditioning the metal surface in an anaerobic solution. Short time readings, such as 30 minutes, do not indicate the equilibrium potential. Continuous measurement of the potential

"in situ" is possible since it appears that the electrode can be immersed for long time periods without deleterious effects.

The addition of lactose broth to a digested sludge media yields a correlation between the potential and the gas production rate. The potential range spanned by this system is from an E_h of -160 to -310 mv.

The sludge digestion process yields consistent potential values. Abnormal conditions yield changing potential values. A continued positive trend can be indicative of a digestion failure. The potential range spanned by a sewage sludge system is from -180 to -290 mv. The optimum O-R values appear to range from -220 to -290 mv.

A single electrode reading within the optimum range does not indicate the degree of digestion. For digester operation, potential changes are more indicative than potential levels within the optimum range.

The rate of gas production can be related to potential changes in batch experiments. For continuous and steady operation, there appears to be little relationship. The potential can reflect the efficiency of the digestion process under certain conditions.

The response to additions of raw sludge to a batch-type digester usually consists of a potential rise followed by a return to the original potential. The potential rise is increased by low temperature feeds and is decreased by agitation.

Although gold and platinum electrodes do not differ significantly during the sludge digestion studies, differences are exhibited in the quinhydrone system and in the individual potential determination of a poorly digested sludge. In these cases gold appears more sensitive to weak oxidation-reduction systems.

The number of electrodes used in the measurement of the sludge potential should be at least three. Otherwise an erratic electrode can yield misleading results.

The study indicates that the application of oxidation-reduction potential measurements to sewage sludge digestion is feasible and that this technique, although somewhat involved, can provide a method for control as well as providing a better understanding of the process.

Microfilm $3.00; Xerox $10.60. 232 pages.

TRACER STUDIES ON CIRCULAR BASINS

(Order No. 61-3143)

Keith Lawson Murphy, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Gerard A. Rohlich

A rational approach to the design of settling basins is of comparatively recent origin. The majority of existing basins have been constructed on an empirical basis. Further, a review of the literature indicates that present design criteria have been developed largely from studies on rectangular basins. Although many circular basins have been constructed and are in satisfactory operation, detailed information on the hydraulic characteristics of such basins is not available.

To study the hydraulic characteristics of circular basins, a basin six feet in diameter was fabricated of acrylic plastic. A false bottom allowed operation of the basin at side wall depths up to 3.0 feet.

A measure of the efficiency of the test basin was obtained through the dispersion testing technique. Studies were made at different flow rates, side wall depths, bottom slopes and inlet and outlet configurations. The dispersion testing was performed using the instantaneous dosing technique, in which the tracer, sodium monobasic phosphate, was injected under pressure, into the basin influent, in a time interval of from five to seven seconds. The tracer concentration in the basin effluent was plotted against the time of sampling and yielded the dispersion curve of the basin under the test conditions.

The modal time ratio (t_p/T), dispersion index (t_{90}/t_{10}), and index of short circuiting ($(t_g - t_p)/t_g$) were used to define the extent of short circuiting and mixing that existed within the basin. A relationship was established between the modal time ratio and dispersion index. This relationship was based on data from both circular and rectangular basins and indicated the interdependency of mixing and short circuiting.

The results of this study indicate that the center inlet test basin with peripheral effluent weir was less efficient than a 10 foot by 5 foot by 2 foot deep rectangular basin when operated at comparable overflow rates. The substitution of a 90 degree conical bottom had no effect on basin efficiency.

The relocation of the effluent weir to a location approximately midway from the center to the periphery improved the efficiency of the basin, but the efficiency obtained was only equivalent to the worst performance of the rectangular basin.

The decrease in diameter-depth ratio from 6:1 to 2:1 resulted in a non-linear decrease in basin efficiency, the majority of efficiency loss occurring when the diameter-depth ratio was decreased from 6:1 to 4:1. A similar non-linear decrease in efficiency was observed when the overflow rate was increased. The worst loss of efficiency occurred with an increase in overflow rate from 1000 to 2000 gal./sq.ft./day. Further increases of overflow rate to 8000 gal./sq.ft./day had little effect.

In general, with a conventional center feed inlet, as used in most circular basins, an increase in the inlet slot area, stilling well area and submergence increase the hydraulic efficiency of the basin.

Microfilm $2.75; Xerox $8.60. 186 pages.

ENGINEERING, ELECTRICAL

RADIATION FROM A POINT SOURCE IN AN ANISOTROPIC MEDIUM

(Order No. 61-3768)

Elli Arbel, D.E.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Leopold B. Felsen

A procedure is presented for the derivation of formal solutions to the problem of radiation from finite sources

in the presence of gyrotropic regions. The boundary surfaces between adjacent gyrotropic regions constitute a set of parallel planes. The gyrotropic axis is perpendicular to the boundary planes. The above procedure is applied to the problems of radiation from a current element in an infinite and a semi-infinite plasma region. In both cases, the current element is oriented along the direction of the dc magnetic field. Asymptotic expressions for the far field are derived by application of the saddle point method. In the case of an infinite plasma region with an infinite dc magnetic field, explicit expressions are derived which are valid everywhere in space. The physical interpretation of the results is discussed in detail. In the case of an infinite plasma region, the radiation field due to a point source consists of several ray contributions. At the vicinity of a given observation point, each ray contribution behaves like a plane wave whose power flow is directed along the straight line from the point source to the observation point. A graphical construction is presented for the evaluation of the wave numbers of a plane wave from a given direction of the power flow. It is found that for some frequency ranges, the physical space can be divided into several regions by circular cones whose common axis is parallel to the dc magnetic field and passes through the point source. The number of ray contributions is different in each of the conical regions. The configuration of the boundary cones is strongly affected by a change in the applied frequency. The ratio of the amplitudes of different rays at the same observation point, and of the same ray in different directions, depends on the nature of the point source.

In the case of a semi-infinite plasma, a graphical construction for the optical paths is presented, by which the point of observation can be reached from the point source. This construction is based on reflection and refraction laws that relate the directions of the power flow in the incident and reflected (refracted) rays, rather than the direction of the phase gradients. The radiation field at a given observation point consists of ray contributions whose power flow is directed along the above optical paths. The amplitudes of the incident rays are found from the results for the corresponding infinite region. The amplitudes of the reflected (refracted) rays are related to those of the incident rays via reflection or transmission dyadics, which are the analogs of the corresponding scalar coefficients employed in the isotropic case. A phenomenon of backward refraction is observed, whereby the incident and the refracted rays are located on the same side of the perpendicular to the boundary plane. In certain frequency ranges where the point source is located inside the semi-infinite plasma region, curved caustic surfaces appear in the isotropic region. These surfaces are envelopes of well-defined groups of rays. The number of ray contributions at an observation point changes as the observation point moves from one side of the caustic surface to the other side. The shape of the caustic surfaces depends on the frequency range and on the location of the point source.

Microfilm $3.15; Xerox $11.05. 244 pages.

THERMAL DESIGN OF TRANSISTOR CIRCUITS

(Order No. 61-3484)

Robert Abraham Bartfeld, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Robert H. Okada

Thermal design of transistor circuits as represented in much of the existing literature is on a go-not-go basis where the not-go condition is the thermal runaway. The degree of safety or potential weakness of the resulting design is not clearly established. Where degree of safety is considered it is mostly described in an intuitive fashion, unrelated to the price one has to pay to achieve it.

The present work is an attempt to incorporate existing design variables into a rigorous and methodical design procedure. A detailed description of an inherently fundamental variable of thermal design, namely the dissipated collector power, forms a starting point to this work. Its variation with time and temperature was considered in detail. The variation of the operating point with time and temperature received similar attention. An analysis of these variations lead to a new formulation of permissible or desirable ranges of design variables such as current and voltage stability factors. The effect that a-c signals have on these permissible ranges is considered. A diagram, in normalized form, relating thermal safety to current and voltage stability factors was given. With the help of this diagram information regarding power dissipation at any given junction temperature as well as ranges of potential design weakness is also obtained. In addition, the effect of an a-c load on junction temperature is given.

As a result of this approach a new design procedure is developed. Essentially it is carried out in two successive steps obtained by a separation of the a-c and thermal design requirements. Only after all a-c requirements are satisfied, and this includes the incorporation of the thermal time response of the transistor, is the thermal design started. The thermal design is then limited from the start by the inherent limitations imposed by the transistor as well as by the conditions dictated from a-c requirements.

The design method introduced in this work applies to almost any transistor circuit that requires operation over a large temperature range. Better utilization of transistor circuits is achieved as well as a possibility of optimizing transistor circuits is obtained.

Microfilm $2.75; Xerox $7.20. 151 pages.

SHORT-TIME STABILITY IN LINEAR TIME-VARYING SYSTEMS

(Order No. 61-3769)

Peter Dorato, D.E.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: John G. Truxal

The classical stability concepts of Lyapunov and Poincare deal with systems operating over an infinite time interval. In contrast, short-time stability deals with systems operating over a finite time interval. In this dissertation

short-time stability is investigated in linear time-varying systems. This concept of stability finds application for example, in missile and satellite systems where operating times are often of finite duration. Short-time stability assures, in a finite time interval $0 \leq t \leq T$, that all inputs bounded by a prescribed constant ϵ result in outputs bounded by another prescribed constant C. The values of ϵ, C, and T are determined by the particular application at hand.

The study of short-time stability is divided into two categories: undriven systems and driven systems. Undriven systems are represented by the set of differential equations:

$$\dot{y}_s = a_{s1}(t)\,y_1 + a_{s2}(t)\,y_2 + \ldots a_{sn}(t)\,y_n \quad s = 1,2 \ldots n \ .$$

Sufficient conditions for short-time stability are then given in terms of the coefficients, $a_{ij}(t)$.

Driven systems are represented by their impulse response $w(t,\tau)$. A necessary and sufficient condition for short-time stability in driven systems is given directly in terms of $w(t,\tau)$. Sufficient conditions for short-time stability in feedback systems, in terms of the open loop impulse response $g(t,\tau)$, are also included. In addition the concept of short-time C-equivalence, essentially a structural stability concept, is introduced. Necessary and sufficient conditions for two systems to be short-time C-equivalent are presented.

The results are applied to various examples of linear time-varying and time-invariant systems.

Microfilm $2.75; Xerox $3.80. 70 pages.

PROTECTIVE BLOCK CODES FOR ASYMMETRIC BINARY CHANNELS

(Order No. 61-3430)

Charles Visvald Freiman, Eng.Sc.D.
Columbia University, 1961

Hamming distance requirements for pairs of codewords of error detection-correction codes are rigorously extended to the general asymmetric case. The pairwise requirements for codewords of a code which protects against unequal numbers of errors affecting 0 and errors affecting 1 are presented in terms of both vector "distances" and weight-distance relationships.

Codes which admit the detection of all errors in a completely asymmetric channel are then considered. Such codes are termed chainless reflecting the fact that no lattice chain may exist between any pair of codewords when viewed as elements of a binary lattice. Fixed-weight (n/2)-out-of-n codes are then proved to be the largest chainless codes and, for separable chainless codes of k message positions, the necessary and sufficient number of redundancy positions is $\{\log_2(k+1)\}$. The name sum code is given to a separable chainless code in which the redundancy represents, in binary form, the number of 0's among the message positions. It is shown that asymptotically the sum code is twice as redundant as the (n/2)-out-of-n code.

Upper bounds on N(n,w,2u), the number of codewords in a fixed-weight code of length n, weight w, and minimum distance 2u, are then developed. The first bound on N is

$$\left[\frac{n}{w}\left[\frac{n-1}{w-1}\left[\cdots\left[\frac{n-w+u}{u}\right]\cdots\right]\right]\right].$$

Algorithms are then given for refining this bound until, for all $u \leq 5$ and $n \leq 4u$, realizable values of N are achieved.

Finally, a memoryless binary channel subject to additive Gaussian noise is assumed in which it is possible to vary threshold settings at the receiver. The performance of symmetric and completely asymmetric codes, used with their optimal threshold settings, is investigated and it is found that cases exist where the asymmetric code-threshold combination is far superior to the best symmetric code-threshold combination.

Microfilm $2.75; Xerox $4.20. 78 pages.

OPTIMUM PREDICTION WITH A MEAN WEIGHTED SQUARE ERROR CRITERION

(Order No. 61-3837)

Clarence Cramer Glover, D.Eng.
The Johns Hopkins University, 1961

The work presented here can be divided into two distinct parts. The first is an entirely mathematical development dealing with optimum linear network for stochastic processes. The main part of this work consists of a paper which has been published in IRE Transactions on Automatic Control, February 1961. It is presented here essentially as published. Appendices have been added to include those steps omitted from the paper for brevity.

A summary of the paper is as follows: The linear prediction theory is examined using a mean weighted square error criterion. A specific nondeterministic weighting function is used. The problem is reduced to that of solving integral equations which are written in terms of correlation functions which can be calculated by averaging over the ensemble. A complete solution is given for the problem using Gaussian Statistics with no correlation between noise and true signal.

The second part is an analogue computer study. This study serves as a check on the work in the first part. In addition it demonstrates the complete feasibility of making analogue studies to find optimum networks using error criterions which have proved untenable using purely mathematical treatment. A complete description of the program for the analogue computer, the techniques for overcoming the limitations of commercial noise generators and the method of collecting statistical data are given. This work will be exceedingly useful for anyone starting similar investigations of a statistical nature.

Microfilm $2.75; Xerox $5.20. 104 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

A CALCULATION OF STATIC MAGNETIZATION REVERSAL IN A TRUNCATED FERROMAGNETIC CYLINDER WITH AXIALLY APPLIED FIELD

(Order No. 61-3670)

Richard Peyton Halverson, Ph.D.
University of Minnesota, 1961

Adviser: William Fuller Brown, Jr.

An approximate calculation is made of static magnetization reversal in a truncated right circular cylindrical ferromagnet under the influence of an axially applied field. The micromagnetics method is used in which the magnetization is determined by minimizing the sum of three energy terms: the magnetostatic energy of the magnetization in the applied field, the self-magnetostatic energy of the magnetization in its own field, and the crystalline anisotropy energy. The influence of the electrostatic exchange energy is also discussed qualitatively.

The assumption is made that only the axial and the radial components of the magnetization are present; these are expanded in Fourier-Bessel series which are truncated to effect the numerical calculations. The resulting energy expression then appears as a quadratic form in the magnetization coefficients. The constraint of uniform magnetization magnitude is imposed by expanding the squared magnitude in Fourier-Bessel and Fourier-Chebyshev series to the same order as the magnetization components; minimization of the energy quadratic form is then accomplished under the constraint of magnetization magnitude uniform to this order.

Curves of average axial magnetization versus applied field are calculated for four cases, representing different degrees of constraint. Each exhibits hysteresis characteristic of such curves. Coercive force is in each case higher than observed experimentally, but is least for the best approximation used.

Microfilm $2.75; Xerox $4.60. 86 pages.

LINEAR DECISION FUNCTIONS, WITH APPLICATION TO PATTERN RECOGNITION.

(Order No. 61-3770)

Wilbur Hull Highleyman, II, D.E.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Arthur E. Laemmel

A pattern recognition machine may be considered to consist of two principal parts, a receptor and a categorizer. The receptor makes certain measurements on the unknown pattern to be recognized; the categorizer determines from these measurements the particular allowable pattern class to which the unknown pattern belongs.

This paper is concerned with the study of a particular class of categorizers, the linear decision function. The optimum linear decision function is the best linear approximation to the optimum decision function in the following sense:

1. "Optimum" is taken to mean minimum loss (which includes minimum error systems).
2. "Linear" is taken to mean that each pair of pattern classes is separated by one and only one hyperplane in the measurement space.

This class of categorizers is of practical interest for two reasons:

1. It can be empirically designed without making any assumptions whatsoever about either the distribution of the receptor measurements or the a priori probabilities of occurrence of the pattern classes, providing an appropriate pattern source is available.
2. Its implementation is quite simple and inexpensive.

Various properties of linear decision functions are discussed. One such property is that a linear decision function is guaranteed to perform at least as well as a minimum distance categorizer.

Procedures are then developed for the estimation (or design) of the optimum linear decision function based upon an appropriate sampling from the pattern classes to be categorized. The design procedure allows one to eliminate certain redundancies in the resulting categorizer and also in the receptor. Rejection criteria may be included in the design if desired.

Some very general results are obtained in a discussion concerning the design and analysis of pattern recognition experiments. These results allow one to determine how a sample of fixed size should be partitioned between the design and test phases of a pattern recognition machine, and show one how to place confidence intervals on the resulting estimate of the performance of that machine.

A method of estimating performance bounds for a linear decision function which is applicable to the use of the design data is also discussed.

Finally, the concepts and procedures thus developed are applied for illustrative purposes to two examples of pattern recognition – the determination of the geographical source of radio signals based on measurements made at a monitor site, and the recognition of hand-printed numbers.

Microfilm $2.95; Xerox $10.35. 227 pages.

TRANSIENT RESPONSE OF TRANSISTOR VIDEO AMPLIFIERS

(Order No. 61-3887)

Virgil Ivancich Johannes, Eng.Sc.D.
Columbia University, 1961

The transient response of several configurations of common emitter junction transistor video amplifiers is examined using the hybrid pi equivalent circuit. Configurations included are:

i) The uncompensated stage in a cascade

ii) The shunt compensated stage in a cascade

iii) Cascaded stages with shunt-series and series compensation

iv) The emitter compensated stage in a cascade

v) The capacitance loaded stage

It is shown, contrary to some previous assertions, that the uncompensated stage in a cascade does not always display a maximum of gain-bandwidth product with load resistance, and that if the maximum does exist, the decrease in gain-bandwidth product, as the load resistance is increased above the "optimum" value, is at most 29%. Furthermore, the magnitude of the gain is increased, at every frequency, as the load resistance is increased above the optimum value. It is consequently concluded that the possible existence of a maximum in the gain-bandwidth curve may well be neglected in most design situations.

The cascaded shunt compensated stage adjusted for fastest rise without overshoot is analyzed, and reasonably simple expressions for the critical inductance, risetime, etc. derived. The effect of shunt compensation is to increase the gain risetime quotient by a factor which is a generalized version of the 1.43 improvement factor associated with shunt compensated tube amplifiers, and further to remove the factor which causes the gain-risetime quotient of the uncompensated amplifier to decrease with load resistance. The improvement produced by shunt compensation can be quite substantial, especially with low load resistance.

A rough limit on the risetime improvement obtainable with general two-terminal compensation networks is derived. This limit is not apparently a great amount above performance realizable with shunt compensation. Series and shunt-series compensation are also examined, and found inferior to simple shunt compensation if fastest rise without overshoot is desired.

The emitter compensated stage in a cascade, adjusted for over-shoot free transient response is considered also. It is shown that shunt compensation will generally produce a faster rise for a given gain than will emitter compensation.

Expressions simple enough to be useful in design of the single capacitance loaded stage are derived, and some interesting general characteristics of the stage are pointed out. It is shown, for example, that although the stage gain does have two poles, the pole frequencies cannot be associated individually with the transistor and output circuits, except in extreme cases.

Microfilm $2.75; Xerox $8.00. 172 pages.

BASIC THEORY OF SURVEILLANCE SYSTEM DECISION PROCESSORS

(Order No. 61-3574)

Leslie Emmet Matson, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor R. S. Berkowitz

An investigation has been made into the subject of decision processors for use with surveillance systems. The method chosen has been to select a sufficiently simple basic surveillance system model and corresponding performance measures so that a specific optimum decision processor can be derived, and so as not to limit the usefulness of the results to a particular application. The properties of the optimum processor so derived are investigated in detail to illustrate its behavior and to permit comparison with non-optimum processors. A number of generalizations of the basic surveillance system are considered, and their corresponding optimum processors are shown to be direct extensions of the basic decision processor.

The term surveillance system is intended to indicate a system which is designed to detect single events of some sort. It issues a report for each event it detects, but occasionally, because of background noise, for instance, issues a false report which is by itself indistinguishable from a true report. The task of the decision processor is to determine from the time sequence of reports issued by the surveillance system whether or not a sequence of true reports has begun, and indicate an alarm when appropriate. Examples of surveillance systems include high-energy radiation monitors, inspection systems for automatic production equipment, and military detection radar systems.

The false reports are assumed to obey Poisson statistics, with an average report rate which can be a known function of time. (Means of estimating the varying report rates are considered.) True reports also obey Poisson statistics, but occur after an unknown starting time, and have a fixed average report rate. The average rate for true reports is assumed known, or may be selected from a known a priori distribution. It is further assumed that the starting time of the true report generation process has an exponential a priori distribution relative to present time, conditional under the assumption that the true report process has begun. In the simplest case the information from the surveillance system consists only of the time at which each report occurs. A generalization includes the use of data which the surveillance system has gathered and transmitted to the processor in each report. The measures of performance used are the probability of falsely indicating an alarm, and the probability of failing to indicate an alarm when the true report process has in fact begun.

Under the above conditions the likelihood ratio test is optimum, and the system model is simple enough so that the optimum test is a convenient one to use. A specific monotonic function of the likelihood ratio is chosen as being particularly convenient to use as a decision variable for comparison with an alarm threshold. The behavior of this decision variable is investigated in detail, including the behavior of its probability distribution function under changing conditions such as occur when a true report process begins. This permits numerical evaluation of the above measures of performance and of other performance measures for which the processor is not optimum but which may be of major interest to the system designer or user. Microfilm $2.75; Xerox $6.20. 127 pages.

STABILITY ANALYSIS OF TWO-PARAMETER CONTROL SYSTEMS

(Order No. 61-3771)

Martin Lawrence Shooman, D.E.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: John G. Truxal

This dissertation treats the problem of stability in two-parameter control systems. The two-parameters may be loop-gains, time constants, natural frequencies, damping constants, or describing function gains representing system nonlinearities. The limitations of single parameter analysis techniques are discussed and parameter plane analysis introduced.

The two system parameters are plotted along the coordinate axes in the parameter plane. The left-half-plane and the $j\omega$ axis of the s-plane are mapped into a stable region and a stability boundary respectively, in the parameter plane. The parameter plane plot delineates the ranges of the two system parameters that yield stable operation. The Routh Table or other similar stability criteria are used to obtain the stability boundary in the parameter plane. Using appropriate mapping transforms, performance boundaries may be obtained. These transformations allow a mapping of lines of constant σ in the left-half-plane into the parameter plane. Analog computer methods are discussed that allow experimental location of stability and performance boundaries in complex problems.

In Chapter 4, the parameter plane method of analysis is applied to a system with two nonlinearities. A limit cycle oscillation is predicted for the system using parameter plane analysis. The system is simulated on an analog computer, the oscillatory behavior displayed, and the frequency and amplitudes of oscillation predicted. A theoretical and computer study of system compensation is made. The final system with the chosen compensation is found to yield well behaved responses to a wide range of excitation amplitudes.

The concluding chapter discusses three means of analyzing three and more parameter systems. While none of the three methods yield an analysis that is in general satisfactory, as a group they provide a valuable approach to a wide class of multiple parameter problems.

Microfilm $2.75; Xerox $5.40. 108 pages.

APPLICATION OF INTEGRAL EQUATIONS TO APPROXIMATE SOLUTIONS OF ELECTRICAL ENGINEERING PROBLEMS

(Order No. 61-3555)

Sidney Shucker, Ph.D.
University of Pennsylvania, 1961

Supervisor: Raymond S. Berkowitz

This paper is concerned with the application of integral equations to the approximate solutions of certain classes of problems that arise in electrical engineering. The problems that may be treated most advantageously by the methods developed in this paper are those describable by linear, variable-coefficient differential equations with specified initial conditions. These problems arise in such diverse fields as the theory of acoustics, electromagnetic waves in stratified media, nonuniform transmission lines, wave guides, antennas, and time varying electric circuits. Solutions are sought in the form of functional expressions rather than as tables of values. The approximate solutions are obtained by iterative processes, where successive iterations yield successively closer approximations to the true solutions. In addition, there are derived expressions for bounds on the error at the various stages of approximation.

A comprehensive discussion is given of techniques for converting initial-value type differential equation to Volterra type integral equations amenable to rapidly convergent iterative techniques. As illustrative examples, a problem in nonuniform transmission lines and two problems involving time-varying circuit parameters are solved approximately. In each case a bound is determined on the error in the approximate solution.

A discussion is given of the application of Fredholm type integral equations to the solution of two-dimensional electrostatic field problems. As an illustrative example an approximate solution is obtained for the capacitance per unit length of similar concentric elliptic transmission lines.

It is concluded that integral equations may be profitably employed in the approximate solutions of certain important classes of electrical engineering problems and that bounds may be set on the errors of approximation.

Microfilm $2.85; Xerox $9.90. 219 pages.

ENGINEERING, MECHANICAL

TOTAL RADIATION FROM BURNING COMPOSITE SOLID PROPELLANTS

(Order No. 61-3868)

David William Blair, Ph.D.
Columbia University, 1961

Among the several theories of the combustion of composite solid propellants, the Summerfield burning rate law has experienced considerable success in describing the variation of the burning rate with pressure. Also it has been somewhat successful in describing the effects of oxidizer particle size on the burning rate.

The energy equation used in the Summerfield theory neglects radiant energy transfer, and considers only conductive transfer from the gas phase reaction zone to the surface of the burning solid propellant. Consequently, it is felt that certain burning behavior of these propellants which appears anomalous in the view of the present theory might be explicable by considering radiative energy transfer processes from the reactive zone to the solid surface.

A theory is derived to correct the present theory for the effects of radiant energy transfer. The general theory is specifically applied to the cases of a burning propellant strand and of an internal burning cylindrical motor charge.

In the latter case the possibility of radiation induced scale effects on the burning rate is made manifest.

An experimental apparatus was designed and operated to measure the total hemispherical emissive power of 1/4 inch diameter strands of ammonium perchlorate – Rohm and Haas P-13 styrene base polyester resin propellants. The apparatus involved a blackened vacuum thermocouple receiver looking down upon the burning surface of a strand which was burned in a vessel purged with an upward flow of gas around the strand. The results of this experiment were in disagreement with those of another experiment in which the radiation flux through a transverse hole in the side of a hollow burning charge was measured. This latter work was done using a small static solid propellant rocket. The conflict was resolved in favor of the motor data when additional work disclosed the presence of strong absorption of radiation in the exhaust gases over the burning strand.

The radiation intensity was shown to increase linearly with the burning pressure from 80 to 320 psi. This was the limiting range in which data were obtained. The radiation intensity was independent of the oxidizer-fuel ratio of the propellant and at sufficient pressure surpassed the black-body intensity based on the equilibrium flame temperature. This was interpreted to mean that the radiation came from a near black primary diffusion flame which burned at near the stoichiometric ratio. This conclusion is not inconsonate with diffusion flame theory.

The application of the results and theory to explain the differences between the burning rate of a given propellant in a strand and in a hollow charge gave results not compatable with the only applicable motor burning rate data available to this study. The motor and strand burning rate data available for the propellant studied were, however, insufficiently precise to allow a definite conclusion to be drawn.

The data were also applied to strand burning rates to interpret behavior which appeared anomalous from the viewpoint of the conductive theory. Again the results were somewhat inconclusive.

Further work was suggested to generate more precise data on motor and strand burning rates, to extend the pressure range of the present work, to extend the present work to include a wide range of composite solid propellants, and to quantitatively study the spectral distribution of the flame zone radiation.

Microfilm $2.80; Xerox $9.70. 214 pages.

ON THE FLOW OF AN ELECTRICALLY CONDUCTING FLUID TOWARDS A STAGNATION POINT IN THE PRESENCE OF A MAGNETIC FIELD

(Order No. 61-3278)

Arthur Samuel Rathbun, Jr., Ph.D.
University of Pittsburgh, 1961

The flow of an electrically conducting fluid towards a stagnation point in the presence of a magnetic field perpendicular to the plate is analyzed. The analysis differs from other analyses in that results are found for a model which is valid for relatively high magnetic Prandtl numbers and magnetic pressure numbers and therefore applies to a wide range of types of fluids. Results in the literature have been only given for models valid for very small magnetic Prandtl number fluids and of these only ionized air has been examined. The analysis also differs from others in that the high magnetic Prandtl number model is analyzed to show the effect, in conjunction with the magnetic field, of an applied electric field in the plate which is positive or negative. Also presented are the requirement for the variation of the applied electric field in order to obtain a similar solution and a presentation of some of the implications of the stagnation point boundary conditions found in the literature.

An analogy between Maxwell's equation and the momentum equations or the energy equation is discussed. The equation describing the transport of vorticity is shown to be identical to that describing the change of the magnetic field. This analogy has given rise to the naming of the magnetic Reynolds number. It is shown that the energy equation in nondimensional form including a variable wall temperature is identical to the nondimensionalized Maxwell equation, and the magnetic Reynolds number is also the magnetic counterpart of the Peclet number. The applied electric field term is shown to correspond to an internal heat generation or absorption depending on whether the field is negative or positive.

When a magnetic field is applied to the boundary layer of this stagnation point, the flow is modified by two mechanisms. These are the distortion of the outer flow which changes the external pressure gradient and the electromagnetic force which acts directly in the layer. The former mechanism generally has the greater effect. The external pressure gradient is altered by the value of the x-component of the magnetic field in the outer flow. This value is equal to the sum of the x-component evaluated at the plate and the area under the induced current curve vs y. It is dependent on each parameter in the problem. Investigation is made of the effect of the magnetic Prandtl number, the magnetic pressure number, the electric field number, the plate conductivity number, the plate thickness number, and the plate permeability number on the external pressure gradient.

The electromagnetic force in the layer can be thought of as being caused by two factors, namely the current resulting from the motion of the fluid and the current resulting from the applied electric field. The former always opposes the motion of the fluid tending to slow it down. The latter helps or deters the flow depending on whether the applied electric is negative or positive. These have their greatest magnitude at the surface of the plate.

The shape of the magnetic streamlines has an important effect on the characteristics of the boundary layer. The point where the fluid and magnetic streamlines merge determines the thickness of the boundary layer. The magnitude of the slope of the streamline and the rate of change of the slope with y determine the effect of the external pressure gradient and the electromagnetic body force in the boundary layer.

Shear stress results are presented for magnetic Prandtl numbers varying from .001 to 5 as a function of the product of the magnetic pressure number and the magnetic Prandtl number. A comparison is made between these results and (1) those found neglecting the induced magnetic field and (2) those found using a magnetic Prandtl number

on the order of ionized air. Shear stress results are also given for varying electric field number.

Heat transfer results for a thermal Prandtl number of 1 are given for magnetic Prandtl numbers varying from .001 to 1 with the same abscissa as was used for the shear stress. A comparison is made with a model in which the induced magnetic fields are neglected. The shape of the shear stress curves and the heat transfer curves is similar though the heat transfer variation is much less than the shear stress variation.

Microfilm $2.75; Xerox $7.80. 169 pages.

THE EQUILIBRIUM OF SOLID CARBON DIOXIDE WITH ITS VAPOR IN THE PRESENCE OF NITROGEN

(Order No. Mic 61-1792)

Richard Edwin Sonntag, Ph.D.
University of Michigan, 1961

The effects of gaseous nitrogen on the solid-vapor equilibrium of carbon dioxide have been experimentally investigated over the temperature range 140-190°K in 10° intervals at pressures from 5 to 100 atmospheres. The resulting gas-phase composition is compared with that predicted by each of three methods which can be generally classified as empirical (Beattie-Bridgeman equation of state), theoretical (Ewald's method with the Lennard-Jones (6-12) potential and virial equation of state), and generalized behavior (Prausnitz method for estimating interaction coefficients in the virial equation of state). The experimental range of pressure and temperature has been so chosen as to exceed the range of validity of the equations of state at high pressure for the lower temperatures, and to give sufficiently large carbon dioxide concentrations at the higher temperatures to require general solution of the equilibrium equations for the different methods used.

A flow-type system was used in the experimental work, the apparatus including a non-dispersive infrared gas analyzer in the exhaust line to determine the equilibrium point gas-phase concentration of carbon dioxide. Liquid nitrogen was used for cooling the cryostat, with the temperature controlled manually to closer than 0.1°C by the use of heaters.

At each point, six solutions of the theoretical equations were calculated by iterative methods on the IBM 704 digital computer, these including a general and a simplified solution for each of the three methods used. The simplified solution is made by assuming that the carbon dioxide mole fraction is very small and consequently dropping the majority of the terms from the equation.

Comparison of these predictions with the experimental results shows that the Ewald method gives the best overall correlation, closely followed by that using the Beattie-Bridgeman equation. Both are very good except at 140°K, where the predicted values begin to deviate markedly from the experimental at pressures greater than 40 atm., and then fail badly at high pressure. This high pressure region is considerably beyond that for which the equations of state were intended for use. However, at 150° and the same densities the predictions were considerably closer to the experimental, although still high. It was also found that the simplifying assumptions did not significantly impair the accuracy of prediction for carbon dioxide percentages below 2-3%, which is somewhat greater than might be expected. The Prausnitz solutions were consistently high throughout the temperature range, and not nearly as accurate as the others.

Microfilm $2.75; Xerox $7.40. 156 pages.

A STUDY OF AUTOMATIC SYSTEM SIMULATION PROGRAMMING AND THE ANALYSIS OF THE BEHAVIOR OF PHYSICAL SYSTEMS USING AN INTERNALLY STORED PROGRAM COMPUTER

(Order No. Mic 61-1807)

Franklin Herbert Westervelt, Ph.D.
University of Michigan, 1961

The simulation of the behavior of physical systems has been greatly encouraged by the digital and analog computers. Despite many remarkable applications of these machines in this area, many problems have remained untouched because of prohibitive expenditures of time and resources required to analyze and encode the procedures needed for the simulation. As a result, drastic simplifications have often been made in order to accomplish the simulation.

This dissertation presents two procedures, or algorithms, designed to assist in producing more accurate simulations of the increasingly more complicated systems that man wishes to study.

The first, known as the Simulator Program, is a translator able to accept a pseudo-English language description of the system to be studied and produce, when possible, an algorithm in machine translatable language for the simulation. The process may be applied to any system characterizable by a general network. The translation makes use of two libraries of methods and techniques pertaining to the components, or elements, of the particular system being simulated. Since these libraries are accessible to the user of the Simulator within the logical structure of the Simulator, the latest, most accurate representations of each component are available to each analysis.

The second program, known as the Stepwise Regression Program with Simple Learning, assists the Simulator by providing a powerful regression analysis of data pertaining to the characteristics of the components of the system. An analytical representation of the data in subroutine form is automatically produced. The use of artificial intelligence techniques allows the consideration of all orders of interaction in multiple independent variable problems with up to sixty functional representations of each variable allowed. Because of this, the program is of more general interest and utility and was used successfully during its development in the analysis of data arising in many diverse researches.

Together the programs provide the researcher with a powerful technique for studying physical systems accurately and more easily than has been heretofore possible.

Microfilm $3.40; Xerox $11.95. 264 pages.

ENGINEERING MECHANICS

UNSTEADY AND HYDROMAGNETIC EFFECTS ON SLOW VISCOUS FLOWS IN CONVERGING CHANNELS

(Order No. 61-3948)

Frederic A. Lyman, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: Dr. Edward Saibel

Two problems which are related to the flow of a viscous, incompressible liquid in a converging channel are treated separately in this thesis. Chapter 1 consists of the solution of the problem of unsteady flow in a thin film of viscous liquid between converging solid surfaces, one of which is accelerated tangentially relative to the other. In Chapter 2 the slow two-dimensional flow of an electrically conducting liquid in a converging channel in the presence of a magnetic field is considered.

The momentum equations which form the basis of the analysis in Chapter 1 are obtained from the Navier-Stokes equations by neglecting the convective acceleration terms and retaining only the dominant viscous term. Except for the convective acceleration terms, these equations are the same as the unsteady boundary layer equations. However, unlike boundary layer theory, the pressure is unknown a priori, in fact, the dependence of the pressure on position and time is of the main interest here.

The equations are solved by Laplace transform techniques. The rate of flow Q(t) between the surfaces, which is an unknown function of time, appears in the expression for the pressure and must be found by satisfying the boundary conditions on the pressure. An integral equation of the convolution type in Q(t) is obtained and solved numerically. The asymptotic properties of the Laplace transform are utilized to obtain solutions for Q(t) and for the pressure which are valid for small and for large values of time. Comparison of these asymptotic results for Q(t) with the numerical solution of the integral equation shows that the asymptotic solutions are valid except over a small middle range in time. The main result of the analysis is that the pressure initially does not increase as rapidly as the relative velocity of the surfaces. However, transient effects in the pressure are of extremely short duration, and steady conditions are established almost immediately.

In Chapter 2 the problem of steady two-dimensional hydromagnetic flow in a converging channel formed by two plane walls is treated under the assumption that the flow is sufficiently slow to justify the neglect of the inertia terms. A magnetic field is set up by a current-carrying wire along the line of intersection of the walls, and the magnetic field lines are concentric circles when there is no flow. The equations of magnetohydrodynamics are reduced to two coupled partial differential equations in the stream function and the z-component of the magnetic vector potential. A perturbation expansion in R_m, the magnetic Reynolds number, is employed in order to uncouple the two equations. For the case where both walls are stationary, the first two terms in the perturbation series are obtained, and the results indicate that the first correction to the velocity is quite small, even in the case where R_m is of the order of 1. The flow is essentially radial, with a very small tangential component of velocity due to the distortion of the magnetic field lines.

The case of hydromagnetic Couette flow in a converging channel is also examined in the light of its possible lubrication applications. It is found that the pressure force exerted on the stationary wall is increased by the presence of a magnetic field, but this increase is insignificant compared to the force exerted on the wall by the magnetic field. Microfilm $2.75; Xerox $6.60. 140 pages.

NEW TECHNIQUES OF SOLUTION FOR PROBLEMS IN THE THEORY OF ORTHOTROPIC PLATES

(Order No. 61-3569)

Jack Roger Vinson, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Maurice A. Brull

The theory of orthotropic plates and shells is becoming increasingly important in structural problems. This stems from two developments, namely the use of reinforced construction and the development of orthotropic materials with control of the preferred directions. For reinforced structures, which include stiffening by the use of rings, stringers, corrugated sheet core sandwich, waffle, etc., the discrete reinforcements may be assumed to be distributed continuously. It is then possible to determine the deformations by analyzing an "equivalent orthotropic" continuous structure. The detailed stress distribution may then be obtained by considering the actual structural details. The use of orthotropic materials such as beryllium, filament wound materials, fiber-reinforced plastics, pyrolytic graphite, and whisker-reinforced materials requires the development of suitable methods of analysis and design. Such orthotropic structures find their application in the design of heat shields for ballistic missile nose cones, rocket engine cases, submarine and surface ship hulls, to cite only a few.

The solutions of orthotropic plate problems are substantially more difficult than solutions of the corresponding isotropic plate problems. For instance, to investigate the behavior of orthotropic plates for specified boundary and loading conditions, it is necessary to solve three distinct plate problems, depending upon the values of the plate rigidity ratios, if the Lévy type solution is used; each of these is at least as complex as the isotropic plate solution. The alternative is to use the double trigonometric series solution with its very slow convergence, requiring the use of many terms in computation.

For practical application it is desirable to determine new techniques for the solutions of orthotropic plates which will give a clearer, more unified insight into orthotropic behavior than the classical solutions. These new techniques should also reduce as much as possible the difficulties inherent in the classical solutions.

This dissertation presents three techniques of solutions which meet these objectives. The most important of these techniques was obtained by an asymptotic integration of the orthotropic plate equations and provides a clear insight

into orthotropic behavior. Calculations performed with this solution produce accurate results within a fraction of the time required for the classical form. The present technique also avoids the numerical difficulties which tend to reduce the accuracy of the previous solutions.

It has been proved that this solution is in fact a uniformly convergent series which therefore represents a new form of the exact solution, rather than an asymptotic form. The radius of convergence of this series is such as to cover most of the practical range for the values of the physical parameters.

Microfilm $2.75; Xerox $4.40. 82 pages.

APPROXIMATE SOLUTIONS FOR REENTRY TRAJECTORIES WITH AERODYNAMIC FORCES

(Order No. 61-3746)

Kenneth Kwang-Hwa Wang, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Lu Ting

When the equations of motion of the reentry vehicle are written as components in and normal to the instantaneous trajectory plane they become two independent sets of equations. The reentry trajectory is thus equivalent to a planar trajectory plus the motion of the instantaneous plane which can be treated separately.

The analytic solution of Allen and Eggers for the ballistic reentry trajectory at an entry angle not too shallow and that of Lees, Hartwig and Cohen for shallow entry at near circular orbit velocity with lift are extended in the present thesis to a general reentry trajectory. The solutions are obtained in a closed algebraic form expressing the relations between the velocity, the angle of inclination and the density, or the elevation. They are neither restricted to drag only vehicle at large entry angle nor limited to the near circular orbit velocity at the entry. The numerical computations are compared with the machine results by direct integration of the equation of motion and shown a good agreement. For the particular case of vehicle with large lift and enters the atmosphere at a shallow entry angle, a simpler set of analytic solutions are obtained. Using these results it is found that the peak acceleration is located in general very close to the point of the minimum angle of inclination. For trajectory that skips the exit velocity and the exit angle can be determined. The numerical results from these solutions again compared favorably with that by the machine calculations.

For aerodynamic heating of the vehicle, Lees' formula for the stagnation point of a blunt body at hypersonic velocity is employed. Analytic solutions for the evaluation of the maximum heating rate and the total heat input from the entry to the first lowest point of the trajectory is obtained.

An error analysis is made to determine the relative influence of various factors on the peak acceleration, the maximum heating rate and total heat input.

Before reaching the peak acceleration the trajectory of constant lift and drag coefficients can be changed to a trajectory with constant designed acceleration by lift and drag modulation. When the lift-drag ratio remains nearly constant analytic solutions are derived. For a given range of adjustment in the lift, the maximum possible ratio of the peak acceleration to the designed acceleration are determined.

Microfilm $2.75; Xerox $4.40. 82 pages.

ENGINEERING, METALLURGY

QUENCHING-IN AND ANNEALING OF POINT DEFECTS IN SILVER

(Order No. 61-3873)

Lee Joseph Cuddy, Eng.Sc.D.
Columbia University, 1961

Quenching-in and annealing of point defects were studied in 99.999 percent silver wires. Upon quenching from temperatures between 550°C and 650°C, the electrical resistivity increased according to:

$$\Delta\rho^0 = (15.0 \pm 0.08) \times 10^{-4} \exp[-(1.14 \pm 0.04)/kT] \text{ ohm cm.}$$

The excess resistivity annealed out in two stages. Stage α occurred at -20°C and removed from 55 to 80 percent of the excess. Its activation energy was:

$$E_m = 0.57 \pm 0.06 \text{ eV} .$$

Stage β was centered at 300°C and had an activation energy:

$$Q^* = 1.18 \pm 0.07 \text{ eV} .$$

These results are interpreted in terms of clustering of defects during Stage α, and dissolution of clusters in Stage β. The observation of clustering at low defect concentrations implies strong attraction between defects.

Microfilm $2.75; Xerox $4.80. 95 pages.

A RELAXATION METHOD FOR STUDYING VACANCIES IN METALS

(Order No. 61-3529)

Edward Korostoff, Ph.D.
University of Pennsylvania, 1961

Supervisor: R. Maddin

A method is described for studying vacancies in metals that is based on determining the dependence of the approach of vacancy concentration to equilibrium in a specimen subjected to a periodic temperature variation. The approach to equilibrium is determined by comparing the instantaneous response of electrical resistivity to the periodic temperature variation.

Consideration is given to a pure metal, at high temperature, subjected to a small sinusoidal temperature variation. The temperature is described by

$$T = T_0 + T_1 \sin 2\omega t \qquad (1)$$

where T_0 is the temperature about which the oscillation

takes place and T_1, is the amplitude of temperature variation. The equilibrium concentration of vacancies, n_0, is given by

$$n_0 = e^{-(V-TS_v)/kT} \tag{2}$$

where V is the vacancy formation energy and S_v is the thermal entropy change associated with vacancy formation. The rate of approach of vacancy concentration to equilibrium is described by

$$\dot{n} = -K(n - n_0) \tag{3}$$

where n is the instantaneous vacancy concentration and

$$K = (\text{constant}) \cdot \frac{1}{\ell^2} e^{-M/kT} \tag{4}$$

where ℓ is the average spacing between sources and sinks, and M is the vacancy migration energy.

Equation (3) is solved for n after substituting equations (1) and (2) into it. Using this solution, an expression is developed for the resistivity variation, which is,

$$R(t) = \left[\beta T_1 + \frac{\alpha V T_1 N_{T_0}}{k T_0^2} \cdot \frac{1}{1 + \left(\frac{2\omega}{K}\right)^2}\right] \sin 2\omega t$$

$$- \frac{\alpha V T_1 N_{T_0}}{k T_0^2} \cdot \frac{2\omega/K}{1 + \left(\frac{2\omega}{K}\right)^2} \cos 2\omega t \tag{5}$$

where β is the thermal coefficient of resistance; α is the vacancy coefficient of resistance; and N_{T_0} is the equilibrium vacancy concentration for T_0.

It is shown that for a given T_0, the cosine coefficient is a maximum for $\omega = \omega_M = K/2$. From this relation and Equation (4), M and ℓ are seen to be experimentally determinable from ω_M as a function of T_0. Similarly, the ratio of the cosine to the sine coefficients in Equation (5) is shown to lead to an expression from which V can be likewise experimentally determined. Numerical calculations for gold are made in order to estimate the feasibility of carrying out the proposed experimental method. The results show that reasonable values are predicted for all the experimental parameters, including specimen size, frequency of temperature oscillation, resistance changes, and phase changes.

Microfilm $2.75; Xerox $3.80. 67 pages.

DEFORMATION AND FRACTURE OF CADMIUM AND CADMIUM-MAGNESIUM ALLOYS

(Order No. 61-3471)

Norman Stanley Stoloff, Ph.D.
Columbia University, 1961

The effects of temperature, grain size, alloy content and purity on the deformation and fracture of polycrystalline cadmium were studied in tension in the range from room temperature to -269°C. Yield and flow stresses and average work hardening rates showed only slight temperature dependence. A sharp ductility transition was observed near -155°C, but the ductility remained constant at about 15 per cent reduction in area in the range -196°C to -269°C. The transition temperature did not depend on grain size or on minor differences in purity. No evidence of cleavage was noted under any conditions; low temperature fractures were intergranular. The fracture stress at low temperatures was found to obey the equation $\sigma_F = \sigma_0 + kd^{-1/2}$ with $\sigma_0 = 0$.

The addition of magnesium in solid solution caused an increase in yield and fracture stresses at all temperatures, and the transition temperature was raised. Basal cleavage cracks were noted in two alloys under a variety of test conditions, but the cracks were shown to be resistant to propagation at -196°C. Reduction of axial ratio effected by the addition of magnesium had little effect on slip or fracture mechanisms, except for an alloy with c/a near 1.732. The latter exhibited little twinning, as expected from the dependence of twinning shear on axial ratio.

Pyramidal $\{11\bar{2}2\}$ slip was shown to operate in cadmium single crystals and bicrystals tested in bending and compression at room temperature and at -196°C. Traces believed to arise from the same slip systems were observed on polycrystalline cadmium at -196°C as well.

It was concluded that the high residual ductility of cadmium at low temperatures is a consequence of low flow stresses and the absence of dislocation locking, coupled with the persistence of minor deformation modes. Although no definite explanation of the ductility transition could be advanced, the suppression of recovery at low temperatures is probably a contributing factor.

Microfilm $2.75; Xerox $6.40. 131 pages.

ENGINEERING, NUCLEAR

REACTIVITY EFFECTS OF MODERATOR EXPULSION IN AN ENRICHED, LIGHT WATER REACTOR.

(Order No. Mic 61-1783)

Jerome Lee Shapiro, Ph.D.
University of Michigan, 1961

An experimental and analytical investigation of the effect of removal of part of the water moderator on the reactivity of a small, pool type reactor is made. The experimental technique consists of bubbling air through one element of the core at a time. The air volume (which is considered to be a void) is determined by calibrating measurements made in an out-of-core gamma ray densitometer. Density perturbations made in individual (3" x 3") core elements produced void coefficients ($\equiv \frac{\Delta k}{k} / \frac{\Delta v}{v}$) varying from - 0.316 at the center to - 0.110 at the outer corner of a roughly square core. The average void coefficient produced by volumetrically averaging all the local coefficients is - 0.190. Linearity of the reactivity effect with void concentration is observed up to the maximum void fraction introduced of 11 per cent.

This was compared with a diffusion theory analysis

which includes a comparison of two-group perturbation, one-dimensional and two-dimensional eigenvalue variation methods. This shows that for uniformly distributed density changes perturbation theory is simple and accurate (within 5 per cent). It is also apparent that variation of the geometry (e.g., cylindricizing a parallelepiped) has very little effect on either uniformly distributed or localized reactivity effects.

Effects of neutron streaming, neutron temperature changes, and changes in flux depression are shown to be negligible in the average water density range ($\rho > 0.75$ gm/cc) examined. The most important feature not adequately accounted for by applying density-changed cross sections to one or two-dimensional codes is the variation of transverse bucklings. This is examined with the aid of the Buckling Iteration subroutine of the MAGNUM code. The combination of buckling iteration with any of the two-group techniques previously mentioned will adequately treat the distributed void coefficient problem. However, for localized voids this technique is not accurate since it assumes no radial variation of axial buckling (separability). The interior void coefficient is overestimated while the outer void coefficient is underestimated (both by about 15 per cent – 30 per cent). On the basis of this evidence suggestions are made for modification of the buckling iteration procedure to allow radial variations of axial bucklings.

Microfilm $2.75; Xerox $6.00. 121 pages.

ENGINEERING, SANITARY AND MUNICIPAL

RADIOACTIVITY OF NUCLEAR REACTOR COOLING FLUIDS

(Order No. 61-4508)

John Clayton Ward, II, Ph.D.
The University of Oklahoma, 1961

Major Professor: George W. Reid

In the design of shielding for the cooling system of a nuclear reactor, it is necessary to know the amount and kind of radioactive isotopes that will be present in the coolant. The results of this study provide a basis for predicting the quantity and identity of the radioactive isotopes in a nuclear reactor cooling system.

There are five ways that radioactive isotopes can be added to the cooling system of a nuclear reactor. These are: (1) activation of the coolant itself, (2) activation of impurities in the coolant, (3) recoil of radioactive nuclei from materials in the reactor core, (4) recoil of fission products from U^{235} contamination on the reactor fuel elements, and (5) possible leakage of fission products from the reactor fuel elements.

There are four ways that radioactive isotopes may be removed from a reactor cooling system. These are: (1) ion exchange, (2) vacuum degasification, (3) radioactive decay, and (4) dilution by make-up water.

Insofar as activation of a coolant and impurities in a coolant is concerned, it has been established that the effective retention time for fission neutron reactions is the same as the actual retention time. It has also been established that the effective retention time for thermal neutron reactions may be as much as 21.8 times as long as the actual retention time since the thermal neutron flux is replaced in part by moderation of the fission neutron flux.

Where radioactive isotopes are produced by recoil mechanism, it has been experimentally shown that the effective surface area increases as the recoil range decreases. The manner of this variation has been empirically formulated. As expected, the increase in effective surface area only partly compensates for the decrease in recoil range.

In order to use equations previously developed for equilibrium activities in a nuclear reactor coolant, a non-equilibrium equation has been developed that relates the activity of a radioactive isotope at any time to its equilibrium activity. The non-equilibrium equation takes into account the following: (1) flow rate through the ion exchange media, (2) make-up water flow rate, (3) flow rate through the vacuum degasifier, (4) half-life of the radioactive isotope, (5) efficiency of ion exchange, (6) efficiency of vacuum degasification, (7) flow rate through the reactor core, and (8) the volume of the cooling system.

Experimental verification of the non-equilibrium equation established the following: (1) the efficiency of ion exchange is a constant in time until the ion exchange media are exhausted and is independent of the activity of the radioactive isotope in question, (2) the efficiency of vacuum degasification for non-gases is zero, and (3) the oxide film hypothesis for the production of Na^{24} in a water cooled nuclear reactor is invalid at least for the reactor studied, since the production rate of Na^{24} is a constant.

Microfilm $2.75; Xerox $5.80. 118 pages.

THE DRAWINGS AND WATERCOLORS OF TURNER

(Order No. 61-3879)

Ruth Mary Firm, Ph.D.
Columbia University, 1961

Through the terms of Turner's will and codicils, and subject to a compromise decree of March 19, 1856, an enormous number of his oil paintings, watercolors and drawings came into the possession of the British nation. Since 1931 the watercolors and drawings have been housed in the British Museum, and it is largely by means of this body of material that Turner's development has been traced.

Turner was attracted to the styles of many artists in his early years, and quite willingly learned from his predecessors and contemporaries. At first he used the traditional stained, or tinted, technique of watercolor, but about 1797 or '98, he began working in pure watercolor, laying in the subject from the beginning in its local color without previously indicating shading. Primarily through these works of Turner, the method of painting in watercolor was reversed; and, by 1805, the new technique was widespread.

Having established his reputation in watercolor, his exhibited paintings from 1802 onward were mostly in oil. But he never stopped working in the watercolor medium, using it more constantly than any other artist. In fact, in his middle years, when he produced vast quantities of engravings, his studies for these were made in watercolor. This is contrary to usual practice, and demonstrates the way that he thought in color rather than in line.

A deep concern with light and color is manifest as early as the 1790s in his light-filled interiors, and the brighter color of his direct watercolor technique. These problems are given more and more attention, and, with the Venetian trip of 1835, are carried through to their final stage: color is suffused with light -- one cannot be separated from the other. To those of the Impressionist group who went to England in 1870, it must have been something of a surprise to realize that thirty-five years earlier Turner had anticipated them in their pursuit of light and its effect on color. How much Turner may have hastened their maturity is difficult to gauge. At the very least he confirmed their point of view.

There are many pencil sketches in the Bequest; pen sketches are rather infrequent. The early architectural drawings in which he wished to be factually correct are done with care. After 1824, however, the notebook sketches are mostly notations which have little meaning for the spectator, but conveyed to Turner all he wished to know. Line drawing is seldom an end in itself as the watercolor sketch may be.

And Turner's manner of working in oil also reflects his devotion to watercolor. As relatively little change is possible in the latter, one must work rapidly and assuredly. This spontaneity is transferred to oil. The sparkle of the smooth white watercolor paper may have suggested the idea of working from a light rather than the more traditional dark ground; and he uses heavy white sizing whose luminosity comes through the thin layers of oil. In both mediums the painting is built up by means of transparent films of color. The character of oil is also changed -- it is suggestive and elusive with little emphasis on form. Because of the fact that Turner approaches oil with the mind and eye of a watercolorist, he is more able to thrust aside traditional limitations.

Turner is pre-eminent among watercolorists. Unorthodox in his own generation, he presents a decisive break between the "old masters" and modernity.

Microfilm $4.10; Xerox $14.40. 317 pages.

THE GENESIS OF THE ADAM STYLE

(Order No. 61-3907)

Samuel Damie Stillman, Ph.D.
Columbia University, 1961

The Adam style was born in Italy in the 1750's. It was a product of Robert Adam's training and experience in Scotland and of the trends and tenets of Neo-classicism, which he discovered in Rome. Robert Adam (1728-1792) received his early training from his father, the leading Scottish architect of his time. Many features of William Adam's architecture were soon rejected by Robert, but certain elements remained integral parts of the younger Adam's work. The Palladianism of the Burlingtonians and the English Rococo taste first fostered by his father were heightened by Robert's drawing and practice in the late 1740's and early 1750's and by his journey to England in 1750. To these Robert added an enjoyment of landscape and an interest in Gothic, both indicative of a romanticism that underlay much of his style.

That Robert Adam radically altered his architectural and decorative manner of the early 1750's was due to his Grand Tour, undertaken from 1754 to 1758. His journey to Italy and especially his study in Rome were the catalytic agents in the creation of the Adam style as it is generally known. Robert encountered in Rome the first great flowering of Neo-classicism. Under the tutelage of Clérisseau and with the encouragement of Piranesi and others, Adam acquired a strong dose of Neo-classical doctrine and artistic details. He examined and sketched Roman ruins and Renaissance decorations; he collected ancient marbles, as well as casts and drawings. From Clérisseau, from the aesthetic climate of Rome in the mid-1750's, and from books he learned of French Neo-classicism. The influences coalesced with the Burlingtonian and English Rococo elements of his training to produce the Adam style.

This style, created in Italy in 1755-57, matured in London in the first seven years of Robert's career. In his

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earliest designs in England, he utilized a virtually undigested mixture of the various elements. Very quickly, however, he refined his style, suffusing the spirit of antiquity and the features of English Palladianism with a flat and very elegant manner. It is a style characterized by novelty and variety, theme and infinite variations. By the middle of the 1760's Adam's mature style can be seen. He further refined it, adding new features and eliminating a few others, but the basis for the style that is typical of his entire career was fully evident in the period between 1758 and 1764.

In the preparation of his drawings and in the execution of his designs, Robert had the assistance of numerous draftsmen, both Italian and British, and a host of craftsmen, as well as of his younger brother James. All contributed to the production of the Adam projects, but the dominant force remained Robert himself. Trained by his father, educated and broadened by Clérisseau, aided by James and by the collaboration of office assistants and craftsmen of all description, Robert evolved the Adam style and supervised its execution. Without any of these, it would not have been the same, but it principally owes its creation and development to Robert Adam. The introduction into England of Neo-classical architecture and decoration is due to a large extent to him. In his training and early career in Scotland, in his study and experiences in Italy, and in his first designs in England can be seen the genesis of the Adam style.

Microfilm $6.30; Xerox $22.50. 496 pages.

JOHN ROGERS, THE PEOPLE'S SCULPTOR.

(Order No. 61-3474)

David Harold Wallace, Ph.D.
Columbia University, 1961

Between 1860 and 1893 John Rogers, "The People's Sculptor," made seventy-six genre and literary "groups," of which he sold about 80,000 plaster copies. This study seeks to explain how his background and temperament led him to produce this type of sculpture rather than the large, idealistic marbles favored by most sculptors of his time. It analyses, also, his relationship to the Realistic movement in American art and literature, the reasons for his great popularity, and the sales and promotional techniques Rogers used to maintain this popularity for three decades.

John Rogers was born into a Boston family of good social position but little money. His education was practical rather than classical, since his parents could not afford to send him to college. After leaving school at sixteen, he learned the trade of a master mechanic at Manchester, New Hampshire, and practiced it for eighteen months at Hannibal, Missouri. This experience gave him a healthy respect for manual labor and the working class. Through his trade he came to know something of a variety of environments -- Manchester, a New England mill town; Hannibal, a river and railroad town in a slave state; and the bustling and aggressive Chicago of the late fifties. Earlier he had also spent several years in Northampton, Massachusetts, where he developed a life-long love of rural scenes and country people.

Rogers began modelling small clay genre groups as a hobby in 1849 and nine years later he decided to become a professional sculptor. Nine months of study in Paris and Rome only confirmed his distaste for the lack-lustre idealism of the sculpture then in vogue and convinced him that the realistic style he had developed independently was more in tune with the time in America. Artistically he was closer to the genre painters of his day than to the sculptors. In his cheerful portrayal of ordinary people involved in everyday events he was also close to the "Realists" among the American writers of his time, such as the novelist Howells and the poet Whittier.

Rogers' popularity stemmed from his Civil War groups, the first of which appeared in 1861, less than two years after he settled in New York. After the war he went back to domestic and literary subjects which won him great popularity especially in the East and Middle West. The many scenes of childhood and rural life appealed strongly to city and town dwellers, who remembered wistfully a simple country childhood free from the complications attendant on involvement in the industrial and urban revolution, while his literary groups flattered the cultural aspirations of a self-made, prosperous middle class. During the thirty years of his vogue Rogers was almost universally praised, by artists and public alike, for his realism, humor, and artistry.

From the beginning Rogers followed a policy of "large sales and small profits." To accomplish this, he developed a national market for his groups through the wide display of samples, organized newspaper and magazine publicity, distribution of illustrated catalogues, and the release of photographic reproductions.

The prime reason for the decline in popularity of the Rogers Group after 1887-88 was a change in artistic fashion. People eventually tired of a type of art which had been popular for a full generation. The depression of the late eighties and nineties may also have had a damping effect on demand for a luxury. During his last five active years Rogers attempted more ambitious works but with little success. By the time of his death in 1904 he was almost forgotten by the general public and honored by fellow artists principally as the first man to make sculpture genuinely popular in America.

Microfilm $3.55; Xerox $12.40. 274 pages.

THE LEGENDS OF KING RICHARD I, COEUR DE LION: A STUDY OF SOURCES AND VARIATIONS TO THE YEAR 1600.

(Order No. 61-3491)

Bradford Browne Broughton, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. MacEdward Leach

Throughout the centuries since his death in 1199, King Richard I of England has been a hero. In light of his attitude toward England while its king, Richard should not be so honored. Yet he has become the focal point of a series of legends which glorify his character out of all historical proportion. This dissertation sets out to discover the motivation for the English to make a hero of this ineffectual king.

The first chapters of this work present an historical picture of King Richard's life, beginning with a few legends of his ancestors, and tracing his career through his princedom, his ascension to the throne, his crusade, his capture and release from prison, and finally his death.

In marked contrast to this factual account, the next chapters provide a portrait of King Richard as he exists in legends. Arranged in an order paralleling as closely as practical the chronological events of his life, these legends show in detail the legendary Richard as distinguished from the historical Richard. For example, legends credit him with having a demon mother; with making a pilgrimage to the Holy Land to scout out the terrain before embarking on his crusade; with being captured by Modred, King of Almain, on his return from this pilgrimage; with eating roast saracen; with duelling with Saladin; with killing a lion and eating its heart; and with many more deeds of a legendary and heroic nature.

The major legends are traced in the succeeding chapters to their sources, and are amplified to show the variations to which they were subjected during the ensuing centuries. Such a study required the examination of many medieval chronicles and the work of troubadours, some of whom Richard knew at Marie of Champagne's court at Poitiers. Finally, two sources which added the majority of legends to this corpus of legends about King Richard were a metrical romance written about 1230-1240, The Romance of Richard Coeur de Lion, and the Récits of a ménestrel de Reims.

Furthermore, Richard was a stalwart fighting man in an era that respected and admired brave warriors; he was, for the church, a champion who took decisive steps to defend the church against heathen infidels by leading a Crusade to rescue the Holy Land from Saladin and his Saracen horde.

Thus, this method of studying the legends circulating around Richard reveals certain steps in the process of making Richard a hero. First, chroniclers tended to adapt ancient legends to Richard during his lifetime. Second, chroniclers, troubadours, and minstrels elevated Richard's deeds to heroic proportions. Third, troubadours and minstrels tended to unite Richard with King Arthur by associating the two monarchs in legends. As a result, these legends developing about him, within his lifetime and a few years after his death, transformed him from a commonplace king to a national hero. These legends were not contrived to mask the true nature of a base creature; they were intended by a wide variety of writers to accord him the fame which they felt his actions proved he deserved.

By his deeds, Richard became a hero to the people of the middle ages. To his reputation as a military hero and a stalwart defender of the faith, chroniclers added other heroic traditions. Then both the author of the romance and the ménestrel de Reims codified and elaborated these traditions. Although later generations developed a more skeptical attitude toward these legends of Richard, they did not lose their esteem for him; to them he still was a hero.

Microfilm $3.00; Xerox $10.60. 231 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

STUDIES ON THE HETEROGENEITY OF CASEIN BY ZONE ELECTROPHORESIS ON PAPER

(Order No. 61-3240)

Leonard Morton Libbey, Ph.D.
Washington State University, 1961

Chairman: U. S. Ashworth

Although casein was considered to be a homogeneous protein for many years, it is now recognized to be heterogeneous and to contain several components. Paper electrophoresis was chosen as a simple and effective technique to study the heterogeneity and properties of whole casein and its fractions. The present study was designed to:

1. Establish the conditions for the optimum resolution of whole (unfractionated) casein.
2. Examine the major casein fractions by paper electrophoresis and determine their homogeneity.
3. Apply the technique of paper electrophoresis to the detection of changes in skim milk and casein-lactose mixtures after heating.

Whole casein was prepared from fresh pasteurized pooled skim milk by two methods, isoelectric precipitation at pH 4.6 and precipitation with NaCl. The urea method of Hipp et al. was used to prepare β-casein and whole α-casein ($\bar{\alpha}$-casein). Whole κ-casein ($\bar{\kappa}$-casein) and αr-casein were prepared from $\bar{\alpha}$-casein essentially by the procedure of Long et al. The pH 4.0 soluble fraction of whole casein was prepared by a modification of the method of McMeekin et al.

For electrophoretic analysis the caseins were prepared as sodium caseinates with a final pH of 6.5. The Spinco paper electrophoresis system was used. The most successful buffers for the paper electrophoresis of casein were a NaOH-Na_2HPO_4 buffer of pH 11.7 and $\Gamma/2$ 0.13 and Veronal buffers (pH 8.6-9.0, $\Gamma/2$ 0.050) containing 1-7 M urea. Spinco Procedure A, with one modification, was used for the staining and scanning of electrophoresis strips. Instead of the predye heat treatment, the strips were placed for 6 minutes in a predye bath composed of the same ingredients as the Spinco dye bath, but containing no dye. The stained paper strips were scanned with the Spinco Analytrol integrating scanner.

The most important results and conclusions of the present study were:

1. The best resolution of whole casein was in a Veronal buffer containing 4.8 M urea. About 1.3 mg of protein was applied as a band to each Whatman 3 mm paper, at room temperature 8.65 ma (6 v/cm) of current was applied for 18 hours. In decreasing order of mobility the fractions observed were: αr-, $\bar{\kappa}$-, and β-casein and four minor components.
2. Whole casein could be resolved into its $\bar{\alpha}$-, β-, and γ-fractions at room temperature in the NaOH-Na_2-HPO_4 buffer by applying 10 ma (3.2 v/cm) for 20 hours.
3. The pH 4.0 soluble fraction was resolved into eight components in a Veronal buffer (pH 8.7, $\Gamma/2$ 0.025) containing 3 M urea by applying 8.65 ma for 17 hours.
4. $\bar{\kappa}$-Casein was homogeneous in Veronal buffer (pH 8.6, $\Gamma/2$ 0.050, no urea); 10 ma was applied for 14 hours, 2°C. In the NaOH-Na_2HPO_4 buffer $\bar{\kappa}$-casein partially resolved into two major components. In Veronal buffer containing 1-7 M urea, $\bar{\kappa}$-casein formed a progressively spread out and increasingly slow migrating band as the level of urea was increased.
5. Urea prepared $\bar{\alpha}$-casein resolved into two components in the Veronal buffer containing 7 M urea, while β-casein appeared homogeneous.
6. The relative percentages of the casein fractions were: 41% αr-, 10% $\bar{\kappa}$-, and 43% β-casein and 6% minor components.
7. Skim milk could be applied directly to the paper strips and resolved into five components in the Veronal buffer containing 7 M urea. Heating caused a decrease in mobility and a transfer of area from the fastest to the second fastest peak.
8. Electrophoresis of a heated casein-lactose mixture indicated a progressive decrease in peak area with heating; it was thought that Maillard browning made some of the dye binding sites unavailable to the bromphenol blue dye used.

Microfilm $2.75; Xerox $5.00. 97 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

RESIDENTIAL EXTENSION IN A METROPOLITAN REGION: A REGRESSION ANALYSIS OF SUBREGIONAL DEVELOPMENT RATES IN THE PHILADELPHIA AREA DURING THE 1940-50 AND 1950-55/56 PERIODS.

(Order No. 61-3520)

Willard Bernard Hansen, Ph.D.
University of Pennsylvania, 1961

Supervisor: Gerald A. P. Carrothers

The study was undertaken to appraise the historical accuracy of a series of regression models yielding residential development rates for metropolitan subregions; to investigate the meaning of the statistical results for urban spatial structure; and to explore the applicability of study concepts and findings to urban planning.

Several hundred bivariate and multivariate regression equations were formulated with data that were available for subregions of the Philadelphia Metropolitan Region for the 1940-50 and 1950-56 periods. Each equation yielded subregional development levels as a function of subregional levels of one or more of the following "development factors": Residential Settlement, Intrametropolitan Centrality, Intrametropolitan Residence Access and Intrametropolitan Employment Access. The equations differed by function type, subregion set, development rate, development factor index, and factor combination. The analysis was limited to residential change in subregions containing substantial amounts of open sites for private homebuilding. Calculation of the regression coefficients, measures of historical accuracy and intrametropolitan access indices ("potential" and "total friction") necessitated the use of electronic computers.

The historical accuracy of the regression equations varied greatly: for example, corrected coefficient of determination ($\overline{R}^2$) values ranged from .0000 to .8752. Of the three function types under consideration, the power form tended to give moderately to substantially more accurate results than the linear and exponential forms, with the performance levels of the latter two being relatively similar. Explanatory ability varied directly with degree of subregional aggregation (71 vs. 44 subregions), while parametric reliability varied inversely with it. Equations yielding residential development levels in absolute terms registered substantially higher explanatory precision (i.e., smaller residual errors) and substantially lower explanatory completeness (i.e., smaller coefficients of determination) than equations yielding such levels relative to subregional development capacity. Moderate to substantial differentials in historical accuracy were associated with alternative indices of the several development factors; in the case of the aggregate access indices, these differentials were related to the form of the equations. Judged by the performance of their "most explanatory" indices, the individual development factors ranked as follows: (1) Residence Access, (2) Residential Settlement, (3) Employment Access, (4) Centrality. When the factors were used in multivariate combinations, the incorporation of additional independent variables tended to produce moderate gains in explanatory ability ($\overline{R}^2$) together with sizable reductions in the reliability of the regression coefficients. The multivariate reduction in parametric reliability could be attributed to the high degree of intercorrelation characterizing the development factors being investigated.

With respect to urban spatial structure, the statistical results indicated a high degree of bivariate association between residential development and the individual factors under consideration. The results also suggested that a secular rise in "intrametropolitan distance tolerance" levels occurred in the Philadelphia Region during the 1940-56 interval, and that the Region's areal pattern of residential extension was not completely radial.

The applicability of the regression equations to urban planning was investigated through the formulation of a basic projective technique deriving from the concepts of the study, and through an evaluation of the probable operational adequacy of that technique. The explanatory precision registered by the regression equations did not appear to be sufficiently high to meet planning agency needs. However, development of more sophisticated equation forms and variables, and the availability of more reliable data, might enable a planning agency staff to attain substantially greater accuracy with the basic technique in question. Microfilm $4.50; Xerox $16.00. 351 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

THE TECTONIC HISTORY OF MOUNT DIABLO, CALIFORNIA.

(Order No. 61-4126)

Ivan Paul Colburn, Ph.D.
Stanford University, 1961

The area studied surrounds Mount Diablo, the most prominent geographic feature in Contra Costa County east of San Francisco Bay.

The oldest rocks are found in the core of Mount Diablo and belong to the Franciscan Group (Jurassic ?); they consist chiefly of structurally disorganized sandstone, contorted chert, greenstone and other rock types.

Marine sedimentary rocks are broadly distributed in the terrain surrounding the mountain. These rocks range in age from Late Jurassic to Pliocene. Approximately 30,000 feet of Jurassic-Cretaceous strata are subdivided into the newly proposed unnamed Jurassic-Cretaceous formation and unnamed Upper Cretaceous formation. An important unconformity marks the Tertiary-Cretaceous boundary everywhere around the mountain.

The Paleocene "Martinez" formation is the basal Tertiary unit; it crops out only on the north side of Mount Diablo. The Paleocene-Early Eocene Meganos formation unconformably overlaps the "Martinez" formation on the north flank of the mountain and rests on Cretaceous strata on both sides of the mountain. Another unconformity marks the contact between the Meganos strata and the base of the overlying Middle Eocene "Domengine" formation. The Upper Eocene strata of the Markley formation and the Oligocene (?) Kirker formation are found only on the north side of Mount Diablo and conformably overlie the "Domengine" beds. An unconformity marks the base of the overlying Late Miocene "San Pablo" formation.

The Mount Diablo area is a complex, off-center, northwest-trending anticlinoriun with the southwest flank overturned. The Mount Diablo fault system, consisting of three northwest trending, subparallel faults, traverses the area. These faults are steeply dipping, are of Quaternary age, and probably have reverse dip-slip and strike-slip components of movement. It cannot be said positively that folding preceded displacements on the Mount Diablo fault system. In any case, the faults and folds both established the present day northwest trending, structural grain of the Mount Diablo area in Quaternary time.

The Franciscan rocks of the Mount Diablo core were probably pushed up through the Jurassic and Cretaceous strata by the diabase intrusive, which is exposed northwest of the mountain, much as the cap rock on a salt dome is pushed upward through younger rocks by the salt. The emplacement occurred after a northwest trending, regional grain had been established and it forced the strata near the boundary of the core into a position subparallel to the contact.

The author describes other structural and stratigraphic features and gives a chronology of tectonic events.

Microfilm $4.95; Xerox $17.55. 388 pages.

THERMAL STUDIES OF SULFIDE MINERALS

(Order No. 61-3875)

James Arthur Dunne, Ph.D.
Columbia University, 1961

Differential thermal analyses have been conducted on both natural and artificial lead-sulfur-selenium compounds. Thermal curves of twelve natural galenas exhibit a striking consistency. In certain instances, limited (5-10°C) variations from the over-all average peak temperature of 783 ± 2°C appear, which seem to be related to lattice parameter differences.

A range of synthetic compounds from PbS to PbSe has been formed by syrosynthesis. X-ray measurements of the series showing unidimensional lattice variation in relation to composition plot as a straight line. Thermal data is interpreted in terms of both lattice energies and the nature of the observed reactions. DTA reaction temperatures are systematically related to cell dimensions in the range PbSe – $PbS_{.7}Se_{.3}$. DTA data taken from samples in the compositional range $PbS_{.7}Se_{.3}$ – PbS are believed to be affected by incongruent anion behavior and surface oxidation effects.

Thermal experiments in the system CuSe – Cu_2Se are also discussed. These include pyrosynthesis, closed system DTA, constant evacuation DTA and correlative X-ray diffraction studies.

Klockmannite (CuSe) is found to dissociate to berzelianite ($Cu_{2-x}Se$) and Se vapor in constant evacuation experiments. The reaction takes place in the temperature range 350°-450°C.

The composition of the mineral berzelianite ($Cu_{2-x}Se$) is found to change toward Cu_2Se with increasing temperature. This reaction is characterized by an apparently small ΔH and occurs over a large temperature range at the heating rate used (12 1/2°C per minute).

Mechanical mixtures of CuSe and Cu_2Se are found to form homogeneous mixed crystals of berzelianite quite readily on heating.

In addition, thermal data have been collected on eighteen synthetic sulfide and related minerals. Among the eighteen minerals described, only breithauptite undergoes no reaction when heated to 1000°C. In a closed system, domeykite, hessite, stromeyrite, altaite, niccolite, herzenbergite, teallite, stibnite, vaesite, penroseite, shandite and chalcositibite are observed to melt at temperatures below 1000°C.

Inversions or suspected inversions have been observed in thermal data for domeydite, hessite, penroseite, stromeyrite, empressite, herzenbergite, teallite, shandite and chalcostibite.

Under constant evacuation conditions, dissociation reactions are observed for tetradymite, empressite, niccolite, vaesite, penroseite, ullmannite, corynite and rammelsbergite. Among these, vaesite, penroseite and rammelsbergite exhibit two dissociation reactions. The products of dissociation have been identified by X-ray study.

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Of the ten distinct dissociation reactions observed in the constant evacuation experiments, five are believed to occur in a closed system. Under constant evacuation, herzenbergite and teallite sublime, stibnite boils, and altaite undergoes what appears to be a combined dissociation sublimation reaction.

Tables are given summarizing the synthesis and thermal data. Microfilm $2.75; Xerox $5.80. 116 pages.

EROSION SURFACES OF MASSACHUSETTS

(Order No. 61-3383)

Roy Lothrop Farnsworth, Ph.D.
Boston University Graduate School, 1961

Major Professor: C. Wroe Wolfe

The recognition of land forms and particularly of erosion surfaces generally has been made on the basis of subjective observation rather than on the analysis of quantitative data. The topography of Massachusetts as interpreted by William Morris Davis has long been presented as the classic example of the dissected uplifted peneplane. This interpretation was the result of the above method of observation from high prominences.

The purpose of this study in part, therefore, was to develop, if possible, a more precise method of erosion surface analysis and to apply it to the land surface of Massachusetts in order to determine in a quantitative way the nature of Massachusetts topography as a whole.

In pursuance of this problem several approaches were employed. The most important approach was through topographic profiles in an east-west direction across the state of Massachusetts at intervals of 2½ minutes of latitude from the northern to the southern borders. Seventeen such profiles were drawn which are recorded in 5 sets of 3 superimposed profiles each and one of 2 superimposed profiles.

Several methods of analysis of these profiles were utilized, the most important one of which has been herein designated as the "Band Width Method of Profile Analysis." A band width refers to a lineal sector of a definite relief amplitude which is superimposed upon the profile lines. This, then, would delineate the existence of an erosion surface. Various band widths were applied and these were raised or lowered so as to include the maximum percentage of the profile lines with as nearly as possible equal amounts projecting above and below the band width. It was thus felt that the most valid identification of a surface could quantitatively be made. Such topographic bands were applied across each set of profiles, and hence identification of a number of surfaces was made. The data thus accumulated is included in tables showing the results and the bandwidths picked as the most valid for each sector.

A second method of analysis was by direct observation of each profile to serve as a comparison to the previously mentioned method. The elevation and lateral extent of what seemed to be surfaces on these were tabulated. The positions and elevations of these surfaces were then plotted on a base map to show clearly the extent of the surfaces. From the results of these two methods were compiled a series of gnomograms on which a ready comparison could be made of the analysis by both methods.

A general study of slopes was also made from the series of profiles. From these it was concluded that there is actually an equilibrium slope angle for the conditions existing in Massachusetts approaching 10° for the majority of slopes.

A second and important approach was to augment the map work with field study. Critical areas, which were the boundaries of surfaces as noted in the map study, were visited to determine possible structural, lithological or glacial controls. An airplane flight over the area was made to see if additional information could thus be obtained, with negative results. Davis's method of observation of scanning the landscape was employed from high places in order to understand the limitations of that approach. Drainage systems were traced; and their trends, gradients and presence of falls and cascades were noted and a definite relationship to the postulated erosion surfaces was well established.

The conclusions reached are that the topography of Massachusetts is not a tilted peneplane as Davis described it. Rather, there are a series of erosion surfaces rising like steps from the seacoast at elevations of 125, 225, 500, 750, 1000-1125, 1250, 1500, 1750 and 2000 feet above sea level with an intervening lower series of steps in the Connecticut Valley area. There is a certain degree of correlation with the conclusions of several other authors concerning similar surfaces in other parts of New England. Hence, a regional explanation based on regional periodic uplift with subsequent erosion continuing after each uplift must be visualized as being responsible for these stepped surfaces. It appears that the "Band Width Method of Profile Analysis" is a valuable tool in the analysis of landforms, since it is based on a quantitative approach.

Microfilm $2.75; Xerox $8.00. 172 pages.

HEALTH SCIENCES, HYGIENE

THE CONSTRUCTION AND EVALUATION OF AN INSTRUMENT TO IDENTIFY THE HEALTH INTERESTS OF HIGH SCHOOL STUDENTS

(Order No. 61-3360)

Rosemary Rita Amos, Ed.D.
Boston University School of Education, 1961

Statement of the problem.-- The purpose of this study was to construct an instrument to identify the health interests of students on the secondary level, and to determine whether any significant differences in health interests exist between the grades and the sexes.

Procedures.-- Two major phases comprised this study. Phase one was the construction of a health interest inventory. In order to obtain a valid list of major health areas and related items, a thorough and careful analysis of twenty-eight state curriculums, ten textbooks and five health journals was made. The selection of the major health areas and of the related items proceeded from this analysis. Before being administered, the inventory was submitted to two juries to establish the content validity and built-in reliability. Phase two included the administration of the Health Interest Inventory to 646 students in grades nine through twelve, in two schools, of which 552 IBM answer sheets were accepted for statistical analysis. The statistical treatment and the interpretation of the data was analyzed to discover what recommendations they yielded for the development of a more functional curriculum in health education.

Results

1. Health areas of greatest interest to all classes were Health and Human Relationships, Personal Hygiene, and Growing into Maturity.
2. Safety and First Aid, Health and Human Relationships, and Growing into Maturity were of high interest to the boys.
3. The girls in all four classes were interested in Health and Human Relationships, Growing into Maturity, and Family Life.
4. Health areas of lowest interest to the classes were Dental Health, Body Structure and Function, and Health Fads and Fallacies.
5. The boys indicated a low interest in Dental Health, Family Life, and Health Fads and Fallacies.
6. The girls showed a low interest in Health Fads and Fallacies, Dental Health, Body Structure and Function, and Community Health.
7. In comparing the four classes' interest in the health areas, a pattern was discernible. The freshman class had the highest interest, followed by the seniors, juniors and sophomores.
8. Significant differences in interest existed between the grades and the sexes on specific items.
9. Certain health interests are common to secondary students regardless of grade in school or sex.

Conclusions

1. If the students' interests are to be considered in curriculum building, the health areas of high interest should be stressed.
2. Since there is a common core of health interests, it does not seem necessary to segregate the boys and girls in health classes.
3. If it is not possible to have health instruction for all four grades, it would be desirable to incorporate it into the curriculum for the freshmen and seniors.
4. Items of highest interest should be stressed. These items would not have aroused their interest and stimulated a desire to have information on these subjects presented in class were they not directly related to daily problems.
5. Health textbooks and curriculums may need to be revised both as to content and methods of approach in the areas of low interest, since the items used on the inventory were drawn from the materials in these sources.
6. The health curriculum should be designed so that areas of particular interest to a grade are included in that grade's work, and areas of low interest excluded from that class if they are of greater interest to another.
7. The large number of areas represented in the health field and the wide variety of students' interests indicate the need for highly qualified health educators.

Microfilm $4.35; Xerox $15.30. 339 pages.

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HEALTH SCIENCES, PATHOLOGY

THE RESPONSE OF CONNECTIVE TISSUE TO CHEMICAL INJURY

(Order No. 61-3140)

Leonard Philip Merkow, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Joseph J. Lalich

The selective toxicity of two chemical agents on connective tissue during maturation of the rat were investigated. Beta-amino-propionitrile (BAPN) produces aortic rupture, skeletal deformities and hernias in growing rats. Progressive stages of aortic injury were examined microscopically and it was found that a reparative fibroblastic process may sometimes prevent fatal angiorrhexis. During the process of aortic repair, medial fibers appeared which had an affinity for elastin and reticulin stains. In addition, elastolysis, a characteristic finding during medial injury, followed rather than preceded fibroblastic proliferation. The appearance of mature collagen with its affinity for aniline blue characterized the final definitive stages of repair. It is believed that this sequence of events represents a progression of immature through intermediate stages into mature collagen. This evidence tends to support a hypothesis that a derangement of collagen fibers is somehow produced by BAPN. Casein added to a diet containing an optimum concentration of BAPN was found to decrease the severity of skeletal alterations and incidence of aortic rupture. Thus, dietary protein as well as growth is believed to influence the response of connective tissue to BAPN feeding.

The excretion of cyanoacetic acid (CAA), a detoxication product of BAPN, can be increased when casein is added to test diets. Therefore, casein probably enhances the detoxication of BAPN to CAA. A correlation between CAA excretion and mesenchymal injury was also demonstrated in this experimental work.

The effect of crude papain on cartilage matrix appears to resemble that of BAPN. However, prolonged administration of papain produced appreciable shortening of long bones without osteomalacia or dissecting arterial hemorrhage. It is believed therefore that crude papain differs in its mode of action from BAPN. BAPN may act by disrupting the molecular cross-linking bonds within mesenchymal scleroprotein units. However, this mechanism of action still remains incompletely elucidated. On the other hand, crude papain is limited in its action to hydrolysis of the mucoprotein complex. These chemicals therefore are excellent agents for the controlled production of connective tissue injury and study of the subsequent repair.

Microfilm $2.75; Xerox $7.00. 146 pages.

HEALTH SCIENCES, PHARMACY

PHARMACEUTICAL APPLICATIONS OF A PINYON OLEORESIN

(Order No. 61-3337)

Victor H. Duke, Ph.D.
University of Utah, 1961

Chairman: L. David Hiner

The natural gummy exudate from pinyon pine has been, and is being used by lay persons to treat both internal and external disorders. The users claim relief, if not complete cure, for various gastro-intestinal, as well as certain external abnormalities.

The purpose of this study was to determine if pinyon oleoresin could be obtained and refined efficiently and economically enough for commercial pharmaceutical application, and also to formulate the oleoresin into both external and internal preparations of elegance.

The oleoresin was collected from a variety of pinyon showing morphological characteristics intermediate between Pinus edulis and Pinus monophylla. Three collection techniques were investigated: (1) scraping off the oleoresin which had accumulated as a result of a natural injury, (2) scarification to induce resin flow with collection by means of metal gutters and cups, and (3) drilling into the wood and collecting the exudate in plastic vials fitted into the holes. Comparison of the yields showed the "cup and gutter" method to be most efficient and productive.

It was necessary to refine the crude oleoresin in order to remove contaminants which had gained entrance to the collecting can. To accomplish this without altering or losing any possible active constituents, required the use of heat, not to exceed 130°C. The oleoresin was heated in a vessel containing a sieve of approximately the same size and shape. After liquifaction had occured, the sieve was raised up through the oleoresin and the foreign matter removed.

Analysis of the volatile oil and resin fractions showed the oleoresin from the "bore and vial" collection to contain the highest percentage of volatile oils and the natural exudate to contain the least amount. The oils were clear to pale straw color, and had a pleasantly pinaceous pinyon odor and an acrid, terebinthic taste. The ranges for the physical constants for the oils were as follows: specific gravity from 0.8520 to 0.8683, refractive index from 1.4713 to 1.4753, optical rotation from +27°20' to +28°41'. The oils were insoluble in less than ten volumes of alcohol and devoid of non-volatile residue. The resin fractions from the "bore and vial" and "cup and gutter" samples were clear to translucent, and orange in color. The sample from the "scrape" collection was dark brown and nearly opaque. The ranges for the physical constants were as follows: acid number from 132.4 to 163.6, saponification number from 170.5 to 173.9, drop-softening point from 55° to 58°C, melting point from 65° to 68°C.

Pharmaceutical preparations were manufactured using pinyon oleoresin. Hydrocarbon and oleaginous base ointments and a cerate were formulated for external use. A dental varnish was made as a cavity liner. A liquid preparation was made for internal use by emulsifying a liquified form of the oleoresin. Capsules were also made for internal use by manipulating the liquified form of the

oleoresin and by using the natural exudate in the semi-solid state.

Before recommending any large-scale consideration of pinyon oleoresin, it was deemed advisable to submit the drug and its fractions to carefully controlled studies in an effort to establish a pharmacological basis for the therapeutic efficacy which has been claimed for it.

Microfilm $2.75; Xerox $5.40. 109 pages.

DESIGN CONSIDERATIONS FOR THE POSTOPERATIVE EVALUATION OF ANALGESIC DRUGS

(Order No. 61-3661)

Polly Catherine Bartholomew Feigl, Ph.D.
University of Minnesota, 1961

Adviser: Jacob E. Bearman

The response of a patient suffering from postoperative pain to an analgesic drug may be related to the time of drug administration (relative to end of operation) and/or the efficacy of preceding analgesic injections. To evaluate the importance of such time effects, data from a double blind clinical comparison of a "test" analgesic to a "standard" preparation have been analyzed in detail.

The design of the experiment involved the administration on demand of four alternating injections of the two compounds to each of 107 patients. Roughly half the subjects received the test drug first and the remainder were given the standard first. The test drug was employed at five doses (only one dose per patient) but the standard drug was always administered at a fixed dose. The data analyzed consist of times of administration and subjective scores of pain relief obtained from hourly questioning of the patients throughout the period of the study.

The following results of the statistical analyses seem to be of methodological interest: 1) For both drugs average pain relief increased as time from first postoperative analgesic lengthened. The increase was of a magnitude to make most within patient comparisons of response to the same drug (dose) at different times significant or nearly so at the usual five percent level. Moreover, time parameters introduced into a linear model in addition to patient and drug (dose) effects were highly significant and accounted for more variability than the drug (dose) effects under study. 2) Associated with the increasing relief over time was an apparent increase in variability. 3) The within patient variability of response to the same drug at different times appeared no lower than the between patient variability of response to different drugs at the first injection. 4) Estimation of the equipotent doses of the two drugs may have been affected by the time trend.

These results provide the basis for the author's conclusion that additional use of the completely randomized design is advisable in postoperative analgesic testing situations. A design in which each patient receives one or more administrations of the same drug (or dose) is recommended for a number of reasons: 1) Confusing changes in the response level due to unequal carry-over effects of different analgesics would be eliminated. 2) Other time effects (due to time of administration or carry-over from preceding administrations) are realistic in that these effects would invariably be present in the routine hospital use of the analgesic. 3) When within patient variability over time is as high as between patient variability at a fixed time the principle advantage of the more complicated crossover design is lost while the difficulties associated with the time trend remain.

Microfilm $2.75; Xerox $6.20. 129 pages.

HEALTH SCIENCES, PUBLIC HEALTH

STUDIES ON THE LIFE HISTORY AND MORPHOGENESIS OF BRUGIA PAHANGI (BUCKLEY AND EDESON, 1956) BUCKLEY, 1958.

(Order No. 61-3787)

John Fredrick Schacher, Ph.D.
Tulane University, 1961

Chairman: Paul C. Beaver

The recognition in recent years that human disease may be caused by several kinds of worms which have normal life cycles in animals has led to increased interest in zoonotic parasite infections. The postulation of a filarial etiology for tropical eosinophilia (eosinophilic lung) is a further demonstration of the need for criteria differentiating filariae in all stages of development if they are found in human tissues.

Brugia (=Wuchereria in part) pahangi was chosen for study as it has once been experimentally shown to produce eosinophilic disease in man, and in another instance, matured in man producing clinical filarial disease.

Objectives of the study were (1) to study the morphology of microfilariae to enable their specific identification in blood films (2) to study larval stages in the mosquito to find possible means of differential identification in surveys of vectors (3) to study developing larvae and adults in the final host both grossly and histologically to enable etiologic diagnosis if filarial agents are found in human tissues.

Microfilariae of B. pahangi can be differentiated from those of B. malayi and B. patei on the basis of body length and cephalic space measurements.

Three of 11 locally obtained species of mosquitoes supported larval growth of B. pahangi: Anopheles quadrimaculatus, A. bradleyi, and Psorophora confinnis. The first species was used for morphologic and transmission studies.

During the first 3 days in the mosquito, the larval body shortens markedly, microfilarial structures are rearranged, the nerve ring is obliterated, and cells show marked growth but minimal multiplication. Following this, mitosis is common, the body increases rapidly in size, and the enteric tract and nerve ring are differentiated by the first molt at 4 to 5 days. The first rectal cell of the microfilaria is thought to form the intestine; the second, third and fourth form the rectum. Association of the first rectal cell with the genital primordium of either sex is thought to be conjectural.

Sexes may be recognized in the late second stage by the placement of the genital primordium. That of the female is found at the mid-esophageal level; that of the male behind the esophago-intestinal junction. The second molt occurs at about 8 days.

The microfilarial tail remains through the first stage, and its cuticle may sometimes be found around the tail of second-stage larvae, where it furnishes a reliable generic character in field surveys.

Third-stage larvae of B. pahangi and B. malayi cannot be reliably differentiated at present.

The larval development of B. pahangi in the final host was studied in cats sacrificed at intervals of 48 hours to 321 days after inoculation of infective larvae. The third molt occurs at about 8 or 9 days; the fourth molt of male larvae takes place at about 23 days; females molt for the last time at about 27 days. Genital structures of both sexes including the spicules begin to develop during the third stage, and assume the mature form by the final molt.

Larvae and adults are most often found in afferent lymphatics of major nodes, but can be recovered from lymphatics of the skin and carcass as well.

Mating first occurred 33 days after inoculation, and microfilariae were first found in the vagina at 55 days. The shortest period of prepatency recorded was 74 days.

Males essentially stop growing after 45 days; females continue to grow for about 120 days. Males of the three Brugia species can best be differentiated by spicule size and morphology. Differences in the placement of the vulva between B. malayi specimens from man and those from animals cast doubt on the taxonomic status of aperiodic B. malayi.

Histologic features of larval stages, juvenile worms and adults were studied. Inter-generic differentiation may be possible on histologic bases, but judging from the similarity of gross structures, diagnosis of members of the genus Brugia on micro-anatomic grounds will probably be difficult. Microfilm $2.75; Xerox $6.20. 128 pages.

HEALTH SCIENCES, SURGERY

THE ORIGIN OF GALLSTONES

(Order No. 61-3694)

Kamil Imamoglu, M.D., Ph.D.
University of Minnesota, 1961

Adviser: O. H. Wangensteen, M.D.

The frequent observation at operation and in autopsy subjects that cholelithiasis is associated with stricture of the terminal common bile duct and/or cystic duct suggest that the stasis of bile in the biliary passages is an important factor in stone formation.

Several animal species, the dog, rabbit, goat, sheep, pig, cat and monkey were used for the first group of experiments. Partial obstruction of the extrahepatic bile ducts in various locations was obtained by placing a piece of cellophane sealing tape dusted lightly with dicethyl sodium phosphate. Dicethyl sodium phosphate stimulates local fibrosis. The desired result was stenosis without complete obstruction of the biliary ducts which was obtained by using a specific amount of sclerosing substance for each animal species. The animals were fed regular laboratory rations and received no special post-operative care. Incomplete obstruction is produced at a) distal common bile duct b) cystic duct c) terminal common bile duct and cystic duct and d) hepatic ducts. Experimentally stones always form proximal to narrowing produced by sclerosing agent.

The second group of experiments was designed to explore the high incidence of cholelithiasis in women who have had multiple pregnancies. This occurrence might be the result of changes in gallbladder function secondary to elevated titers of the placental hormones.

Rabbits of both sexes received a daily subcutaneous injection of a sterile aqueous suspension of progesterone (12 mgm.) and/or diethylstilbestrol in oil (3 mgm.) The animals were kept in separate cages and were fed alfalfa pellets. Stones were found in 80 per cent of female and 50 per cent of male rabbits.

The experimental production of biliary concretions by the prolonged administration of female sex hormones in animals may explain the frequent occurrence of cholelithiasis in women with multiple pregnancies. During pregnancy, hormonal and neurogenic alterations occur and cause functional changes in smooth muscle, glandular secretions, and the vascular system. Experimental, clinical and radiological observations confirm the occurrence of biliary stasis in pregnant women. Our experiments suggest that increased serum levels of female sex hormones may be the cause of this stagnation of bile, which results in the formation of biliary stones.

A review of the records of 100 patients who have had an inspection of the papilla of Vater and sphincter of Oddi at operation, disclosed that in 54 of these, narrowing at the ampulla was such that a 3 mm. probe could not be passed into the duodenum through the sphincter. A pinpoint opening of the papilla into the duodenum is not an uncommon finding when duodenostomy is performed regularly during cholecystectomy for cholelithiasis in patients in whom a 3 mm. Baker dilator cannot be passed readily into the duodenum through a choledochotomy opening.

The biliary system and liver of 200 routine, unselected autopsy subjects were examined and particular attention was given to the size of ampullary opening. The orifice of the ampulla was measured by introducing graduated Baker dilators through an opening in the proximal portion of the common bile duct. In 20 of the 44 autopsy subjects with gallstones, the ampulla of Vater would allow passage of a probe no larger than a #3 Baker dilator. In microscopic sections fibrosis and infiltration by lymphocytes of the involved area were observed. Paraductal glands of the common bile duct were surrounded or replaced by a dense fibrotic tissue.

The production of gallstones in various species by experimental stricture of bile ducts suggests that the stasis of bile in the biliary passages is an important factor in stone formation. The frequent observation at operation and in autopsy subjects that cholelithiasis is associated with stricture of the terminal common bile duct supports this contention in man.

Microfilm $2.75; Xerox $4.80. 94 pages.

HISTORY, ANCIENT

CICERO AND THE AGE OF MARIUS

(Order No. 61-3575)

Kenneth David Matthews, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor William C. McDermott

Throughout his lifetime Cicero, born in 106 B.C., frequently mentioned various details in the career of Gaius Marius who like himself had been born in Arpinum, but fifty years earlier. An indirect family relationship also existed between the two men. The facts of a common birthplace and a family association induced in Cicero a feeling of devotion to the memory of Marius. Evidences of this are to be found in Cicero's writings yet in some instances he did make derogatory remarks concerning Marius, remarks contrary to the favorable opinion which he expressed on most occasions. As a result of these conflicting statements several questions arise. Why did Cicero make such unfavorable remarks? Is it possible to discern any long range pattern of thought on Cicero's part where Marius was concerned? In Cicero's attitude toward Marius is it possible to trace a change of opinion?

In order to study this problem excerpts have been made from all of Cicero's speeches and philosophical writings and the various comments which refer either to Marius or to those men with whom he was most closely associated have been arranged in the chronological order in which Cicero presented them. In addition Cicero's private correspondence has been surveyed in order to correlate his personal opinion of current political affairs with his expressed opinion of Marius. To facilitate a better understanding of Marius himself a summary of his life is included as well as a study of the ancient non-Ciceronian sources from which these details have been derived; writers contemporary with Marius have been separated from those of subsequent periods. In the case of these writers it has also been necessary to demonstrate individual bias or confusion as to certain historical facts. The result of this analysis has been to show that, like other ancient writers, Cicero was prone to consider Marius' career as divided into two aspects – that of the successful military leader and that of the politician. Early in his life Cicero chose to emphasize the military side of his hero, ignoring the crimes which Marius committed in the final years preceding his death in 86. To support his opinion Cicero ascribed the crimes of Marius to other persons. Eventually, however, he recognized the threat posed to the Republic by the rise of Julius Caesar to power. He also observed Caesar's pride in the family relationship which he too had with Marius. As Caesar's authority increased to the point of undermining Republican political institutions Cicero realized how closely Marius was to be associated with Caesar and how much the latter owed to Marius for his military innovations. Still further Cicero perceived the direct similarity between details of his own banishment and those connected with Metellus' exile in 100 B.C. Consequently he could no longer speak of Marius without being reminded of Caesar. Contemporary events had caused him to alter his opinion of Marius and to admit the crimes of which he was guilty. But it was only after the death of Caesar in 44 that Cicero felt free to express his final thoughts on Marius. Until then Cicero feared reprisals from Caesar if he attacked the memory of Marius.

Thus it is possible to prove that Cicero, in his earlier years, did admire Marius but later he was compelled by circumstances to change this opinion. His latest remarks reveal that he had come to despise his fellow-Arpinate. An understanding of this fact makes it possible to consider a more appropriate dating for such works of Cicero as the poem Marius and the de legibus.

Microfilm $3.05; Xerox $10.60. 235 pages.

HISTORY, ARCHAEOLOGY

A STUDY OF THE RELATION BETWEEN PHRYGIAN METALWARE AND POTTERY IN THE EIGHTH AND SEVENTH CENTURIES B.C.

(Order No. 61-3527)

Ann Konrad Knudsen, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Rodney S. Young

In studies of ancient pottery from the Mediterranean and Near East one frequently finds the statement that a particular feature of a certain pot, a pottery vessel shape, or even an entire class of vessels imitates metalware. Examples of metal vessels are seldom given, as little metalware has survived; thus such statements are seldom convincing. Even when metal parallels can be given this is not sufficient to indicate a prior metal origin.

As pottery is an important archaeological document, it would be useful to demonstrate the true extent and nature of influence of the metalware on the pottery industry of any site. This could be done only where pottery and metal vessels are well preserved in quantity. As differences in the properties of clay and metal and the techniques by which they are worked make some forms easier to create in one medium than in the other, a careful study of techniques used in both industries should demonstrate which are especially appropriate to metalwork. If these appear but rarely in clay, as clumsy approximations of their metal counterparts, one might point with certainty to pottery imitations of metalware.

Excavations at Gordion in Phrygia have yielded an abundance of well preserved metal and pottery vessels.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

As Gordion in the eighth century B.C. had cultural affinities with both East and West, its local industries are of particular interest. Gordion has thus been selected as an ideal site on which to base a study of the relation between pottery and metalware embodied in this dissertation.

The dissertation has ten chapters. The first discusses the problem of supposed "metallic origin" for ceramic forms, explained above. Chapter two describes ancient techniques for making metalware. Chapter three discusses the metal vessel industry of eighth century Phrygia, including evidence for metalworking at Gordion, possible influence of foreign industries, and descriptions of local metalworking techniques. This section is of special interest, as it is based on study of the unusually well preserved Gordion metal vessels, on which details of construction can be seen. The fourth chapter is on ancient techniques for making pottery, emphasizing factors which could influence the choice of particular shapes or decoration. Chapter five summarizes pottery making techniques favored in Phrygia.

In the latter part of the dissertation types of Phrygian metal vessels are discussed in detail and compared with pottery counterparts. With the aid of the preceding technical studies, it has been possible to demonstrate that certain pottery shapes and features do indeed imitate metalware; others clearly cannot be metallic. Some influence of pottery on metalware is also shown. Chapter six discusses bowls and basins, seven, jugs and pitchers, eight, ladles and animal-headed situlae, and nine, cauldrons and smaller bowls (dinoi) of the same form. Chapter ten is devoted to conclusions.

The results of this thorough study of Phrygian vessels are interesting. Metalware shapes are found to be mostly different from those of pottery vessels, except the jugs and pitchers, which imitate ceramic forms. Influence of metalware on pottery is shown by imitation of subsidiary features, such as cast attachments, rarely by copying of an entire vessel. There are no major classes of pottery shapes imitating metalware. Differences between Phrygian metal and pottery vessels obviously have a basis in the physical restrictions imposed by the respective materials and techniques employed.

The vessels from Gordion have furnished an ideal body of material for a careful technical study and comparison of the metalware and pottery industries of a particular site. It is to be hoped that similar studies will be made on the finds from other sites in the Mediterranean and the Near East. Microfilm $4.50; Xerox $15.75. 350 pages.

POTAWATOMI INDIANS OF THE WEST: ORIGINS OF THE CITIZEN BAND.

(Order No. 61-3062)

Joseph Francis Murphy, Ph.D.
The University of Oklahoma, 1961

Major Professor: Donald J. Berthrong

The Potawatomi Indians, a powerful Algonquian people, exhibited affinity for fraternization with the white man during their long tenure in the region of the Great Lakes. Although scattered and decentralized, a portion of them received a deep imprint of white civilization, especially from French missionaries and traders. The Prairie Band, almost certainly possessing a measure of Mascouten blood, contained the more primitive elements of the tribe.

By a series of treaties, 1833 - 1841, the great majority of the Potawatomi moved to the Trans-Mississippi West, temporarily locating on two separate reservations. Officially designated as Potawatomi, the United Band of Chippewa, Ottawa, and Potawatomi inhabited a sector of Iowa Territory near Council Bluffs. This faction included almost all the Prairie Band, but had its percentage of cultured mixed-bloods. The Osage River Reservation, an area which later became part of east-central Kansas, was the home of the St. Joseph and Wabash Bands from Michigan and Indiana, with a small minority of Prairie Indians. Study of the characteristics of these separate reservations presents a picture of definite contrasts. Primitive traits abounded among the Potawatomi of Iowa Territory. On the other hand, agriculture became the predominant way of life on the Osage River. Also, mission schools flourished and exercised a major influence; and the adoption of the white man's way moved forward.

The two factions of the Potawatomi, transplanted by a treaty in 1846 to a common reservation on the Kansas River, failed to achieve unity in spirit or in practice. Many disturbances upset the peace of this locale: the Oregon Trail, raiding Plains Indians, slavery and territorial politics, and general depredations of the white man. Nevertheless, the large nucleus of agricultural Indians from the Osage River, plus mixed-blood elements from Council Bluffs, made progress in civilization. This more advanced component constituted the "mission band," which became the basis of the Citizen Band.

Pursuant to government policy, railroad politics, and the pressures of white settlers the Potawatomi of the Kansas River signed a treaty in 1861 which again split the tribe into two factions. The Citizen Band took allotments, while the new Prairie Band elected lands in common on the diminished Reservation in Jackson County, Kansas. Membership in either band was, however, strictly a matter of the individual Indian's choice.

The Citizen Band failed miserably in the allotment experiment. Proper safeguards were positively lacking. By a treaty in 1867, it secured a reservation in the Indian Territory (Oklahoma), where, with difficulty, it succeeded in preserving solidarity and recognition as an Indian tribe. The Oklahoma Potawatomi Reservation continued as the headquarters and administrative center of the Citizen Band, but its membership, largely intermixed with white blood, scattered everywhere.

Microfilm $6.80; Xerox $24.10. 533 pages.

HISTORY, MODERN

PERSONALITIES BEHIND POLICIES: STUDIES OF SEVEN LEADING FIGURES IN ANGLO-RUSSIAN RELATIONS, 1855-1895.

(Order No. 61-3866)

Merritt Gold Abrash, Ph.D.
Columbia University, 1961

This study seeks to uncover the role played in Anglo-Russian relations, 1855-1895, by the personal attitudes and wishes of seven major statesmen. Such an analysis relies primarily upon letters, diaries, memoirs and other sources of personal expression.

Queen Victoria's well-known Russophobia was only a deviation--the causes of which are not clear--from her eminently sensible attitude toward Russia before 1876 and during her last years. However, she had no perceptible effect upon Britain's Russian policy in either case.

Alexander II, a lifelong moderate in the Eastern Question, sought nothing more in 1876-1877 than the succor of the Balkan Christians. He began the Russo-Turkish war with great reluctance after failing to unite the Concert of Europe against Turkey. His anger at British policy was enhanced by his personal break with Queen Victoria, the result of disputes arising from the marriage of his daughter Marie to Victoria's son Alfred.

After Gorchakov's victory in repudiating the Black Sea neutralization, he became less adventurous; he knew that Britain would strongly resist Russian action toward the Straits, and had no illusions about the real value to Russia of the Balkan Slavs. His proposals to have the Concert act for the sole benefit of the oppressed Christians were rejected by either Austria or Britain; the aging Chancellor was then powerless to resist the Ignat'ev program, and his role rapidly diminished.

Disraeli did not dislike Russia; to him she was merely one of the weights in the European balance. His Eastern policy during his 1874-1880 Ministry revolved around two interconnected ends (often obscured by his opportunistic means): the Dreikaiserbund was to be broken up by disrupting its cooperation against Turkey, and Turkey was to be preserved by splitting the Dreikaiserbund. Disraeli succeeded in setting Russia against Austria and Germany, but failed in his effort to seal his victory through an alliance with either of the latter.

Gladstone's supposed Russophilism was in reality only a reflection of his impassioned support of the Balkan Christians. He detested Russia's despotism and was always wary of her expansionist tendencies, but willingly overlooked all this as long as Russia was prepared to take action against the Turks.

Alexander III revealed his inner thoughts (if any) so rarely that no satisfactory picture can be drawn of his attitude toward Britain, aside from a general dislike. Giers, on the other hand, did much serious and intelligent thinking about Anglo-Russian relations only to see his sound advice consistently ignored.

Alexander II, Gorchakov and Gladstone were alike in assuming that the humanitarian virtues involved in aiding the oppressed Christians automatically took precedence over all political considerations. They were simply nonplussed by Disraeli's policy, which, in the name of British interests, sought to increase tensions rather than allay them, regardless of the human misery this entailed. Disraeli's realism led to an impressive personal triumph in 1878, yet Gladstone, often naïve about the motives of the Great Powers, saw deeper and more clearly into the fundamental elements of the Eastern Question (such as nationalism).

In general, the British statesmen had a greater personal impact on Anglo-Russian relations than the Russian, despite the wider freedom of action available to an autocratic foreign policy. The explanation is that Anglo-Russian relations were of central importance to Russia but peripheral to Britain; the latter's statesmen could take risks without endangering Britain's empire or control of the seas, whereas Russian miscalculations could easily lead to a hostile coalition more formidable than the Crimean. For St. Petersburg, the very magnitude of the stakes engendered caution, whereas Russia was not the foremost concern of the foreign policies of either Disraeli, Gladstone or Salisbury.

Microfilm $5.65; Xerox $20.05. 444 pages.

THE ARAB POWER OF TANGANYIKA IN THE NINETEENTH CENTURY

(Order No. 61-3407)

Norman Robert Bennett, Ph.D.
Boston University Graduate School, 1961

Major Professor: William B. Norton

The purpose of this study is to describe the rise and fall of the Arab power in Tanganyika during the nineteenth century. The research for this topic was carried on in public and private centers for East African materials in Salem, Washington, London, Paris, Brussels, Zanzibar, Dar-es-salaam, Bagamoyo, and Kampala.

Muslim Arabs and Persians established centers on the Tanganyika coast from 975 A.D., and perhaps even earlier. Not until the nineteenth century, however, did a significant penetration of the interior begin. Arabs soon visited most areas of Tanganyika, and went beyond into Central Africa. Three main routes through Tanganyika were used. The first went from the area opposite Zanzibar through central Tanganyika to Ujiji on Lake Tanganyika and the regions to the west of it. The second route started at Kilwa and went to the Lake Nyasa area. The third left the northern coast of Tanganyika and led to Kilimanjaro, Lake Victoria, and the surrounding regions.

The Arabs created settlements on these routes to facilitate their trading activities. Tabora and Ujiji, on the central route, were the two most important posts. Few Arabs ever resided in these centers for long periods of time. A small group of Arabs, however, did become attached to each settlement. They organized their own system of government and were usually left with no regulation from their Sultan in Zanzibar, although they kept a loose relationship with him to enable trade to prosper. The Sultan accepted this arrangement; he had little military force to use in the interior of Africa even if he desired to play a more active role. The Sultan was interested in trade above all, and as long as profits continued to come to him, he took little interest in matters of administration.

The Arabs in these centers had practically no interest in affairs unconnected with trade. They made no effort to set up new states or to spread Islam among the pagan Africans.

In the 1870's European missionaries and explorers began to come to Tanganyika in ever increasing numbers. Such organizations as the London Missionary Society, the Church Missionary Society, the International African Association, the White Fathers, the Holy Ghost Mission, and the Universities' Mission to Central Africa founded stations in the inland regions. A study of the relationships of each of these groups with the Arabs before 1885 shows that the Arabs were willing to live in peace with the newcomers. The Arabs of Tanganyika remained interested in trade alone, and left the Europeans in peace as long as the Europeans did not try to interfere in their affairs.

This peaceful relationship changed in 1885, when the Germans declared a protectorate over areas close to the coast. While they were extending this control along the coast, their ineptness and brutality caused a revolt of the Arabs. The latter, as always, were unable to organize a unified resistance, but they kept up a war for two years. When the Germans defeated the Arabs on the coast, they extended German influence into the interior. The Arabs of central Tanganyika, in the Tabora region, made peace at once. The Arabs settled around Lake Tanganyika were less receptive to European control. In the end, however, they were drawn into the Arab-Belgian conflict in the Congo and were crushed.

Thus, at the beginning of 1894, the Arabs of Tanganyika were finished as a significant force. The remaining Arabs in the interior returned to the coast since trade no longer flourished. They left few influences behind to commemorate their half century of domination of the interior of Tanganyika. Microfilm $3.50; Xerox $12.40. 271 pages.

POLITICS OF AN OPPOSITION PARTY: THE REPUBLICAN PARTY IN THE NEW DEAL PERIOD, 1936-1940.

(Order No. 61-3695)

Joseph Boskin, Ph.D.
University of Minnesota, 1959

This dissertation is primarily a study of the opposition of the Republican Party to the domestic program of the New Deal during the second Roosevelt Administration. Specifically, it traces and examines the political, social and economic issues raised by Republican Senators to important legislation; and considers their attempts to revise and/or defeat those measures which ran counter to their interests. At the same time, this work attempts to place the arguments propounded by the law-makers into the larger context of the history and composition of the Republican Party. Thus, the socio-economic-ethnic base of the Party is analyzed for the purpose of making more explicable Republican responses to the vast changes which occurred in American society in the second and third decades of the twentieth century.

A secondary interest is pursued in this dissertation; namely, the nature, role and strategy of an out-party in the American two-party system. By essaying the arguments offered and tactics employed by the Republicans on the floor of the Senate, and, to a lesser extent, in the House, it is hoped that some insight into the machinations and mentality of an opposition party will be gained.

For the greater part, the inner workings of the Republican Party in the 1930's has not been deeply explored. Historians and political scientists have centered much attention on the activities of the Democratic party and, in particular, on Franklin Delano Roosevelt. The impact of Roosevelt on the political scene has so overshadowed the last two decades that the Republic Party has been accorded but shallow consideration.

The role of an opposition party has likewise been neglected; perhaps for a fairly good reason. The concept of a true, or official, opposition party has not been an integral part of American thinking or experience. Hence, we do not recognize the out-party as being the opposition party. In fact, we compliment our parties for their ability to compromise and to adapt quickly to socio-political changes. Many have argued, therefore, that the American political party does not stand on fundamental principles in a manner similar to some European party systems, and that the Democrats and Republicans are basically fraternal twins. Nevertheless, whether we acknowledge it or not, the out-party is continually hungering for the center position in our political structure. As long as it does, it creates an opposition mood, strategy and pattern of thought. Thus, if we are to better understand the workings of our political system, and strengthen the democratic processes, it is necessary that we carefully examine the operations of the minority party.

The very broadness and complexity of this area of study has necessitated the imposition of certain limitations. Emphasis has been centered on the debates in the Senate with less stress having been placed on the activities in the House of Representatives. There are several reasons for this course of action. Firstly, the Senate historically has been the more deliberative body. It takes great pride in its orational prowess. Secondly, debate in the House can easily be shut off making oppositional argument difficult to ascertain. In addition, the objectives of this dissertation could be pursued with greater depth and clarity by concentrating on the major representative Republican figures in the Senate.

Moreover, my concern has been with the domestic rather than the international scene. This implies no unawareness of the external factors which considerably influenced the behavior of the public or the actions of the Republicans in Roosevelt's second Administration. This subject warrants a study unto itself. However, I have attempted to note the influence of international issues as they intruded upon the outcome of specific domestic legislation. Microfilm $3.75; Xerox $13.30. 291 pages.

ANTIMONOPOLY ACTIVITIES DURING THE TRUMAN ADMINISTRATION

(Order No. 61-4499)

Robert Lester Branyan, Ph.D.
The University of Oklahoma, 1961

Major Professor: Gilbert C. Fite

The struggle to arrest industrial concentration after World War II is the theme of this study. It traces the traditional enforcement of the antitrust laws as well as certain innovations in antimonopoly such as aid to small business. During the more than seven years when Harry S. Truman occupied the White House the battle against monopoly seldom was publicized but often played an important part in Administration plans.

Immediately following World War II the Truman Administration opposed concentration in a unique manner by selling surplus plants to new producers in several industries. The most striking example of this was the introduction of competition into the aluminum industry by plant sales to Kaiser and Reynolds.

Under the guise of traditional antitrust enforcement, the Truman years witnessed several major battles. The FTC finally eliminated anticompetitive basing point systems which some industries used to establish standard delivered prices. Meanwhile the Justice Department fought a losing battle in its attempt to limit the economic power of oligopolies. The Supreme Court continued to use divestment with extreme caution, making the trend toward concentration almost impossible to reverse.

Changing the antitrust laws often led to heated congressional debate. During Truman's tenure there was one extension of, and several restrictions on, the antitrust laws. Antitrust enforcement was assisted by the passage in 1950 of an antimerger law which closed a loophole in the Clayton Act and made mergers easier to stop. On the other hand, price-fixing by fair trade laws was strengthened by the McGuire Act, railroad rate-setting bureaus were exempted from antitrust by the Reed-Bulwinkle Act, and an attempt was made to authorize basing points in an act vetoed by Truman in 1950.

The high point of the Administration's nonlitigative antimonopoly efforts was the Small Business Bill of 1950. This program would have provided both money and technical aid to small enterprises. Although the plan was dropped when the Korean War began, several of its features appeared under wartime legislation. The most significant aid to small firms was the Small Defense Plants Administration created in 1951.

Success of the antimonopoly activities under Truman, while not great, did lead to stronger small business and a slowing down of concentration. It can be concluded that the Truman Administration scored a partial victory over economic concentration.

Microfilm $3.30; Xerox $11.70. 256 pages.

AMERICA, RUSSIA, HEMP, AND NAPOLEON: A STUDY OF TRADE BETWEEN THE UNITED STATES AND RUSSIA, 1783-1814.

(Order No. 61-3388)

Alfred Worcester Crosby, Junior, Ph.D.
Boston University Graduate School, 1961

Major Professor: Robert E. Moody

Trade between the United States and Russia has never been given much attention by American historians, particularly by those American historians specializing in studies of our early national period. Therefore, he who would do research on early Russo-American commerce must pore over the manuscript consular and ministerial reports of the American State Department archives, the Massachusetts Historical Society microfilms of the diary and letters of John Quincy Adams, and the manuscript log, letter and account books of the Peabody Museum and Essex Institute of Salem, Massachusetts.

In the early national period of the United States no field of economic endeavor except agriculture was of greater importance to our young republic than our overseas trade. The merchant marine was one of the most important tools in the creation of American economic viability and in the reinforcement of the political independence so recently won. Our merchant marine and our navy could not have operated without Russian imports: iron, sailcloth and – most important of all – hemp and hemp cordage. In the age of sail, hemp was as critically important as is oil today, for hemp cordage was the ligaments and nerves of the sailing ship.

Some hemp was raised in the United States, but of such poor quality that when exposed to brine or to salt spray it quickly deteriorated. Most hemp used on American ships was grown in Russia.

Russo-American trade was also important in the history of Russia and Europe as a whole. Russia was an ally of Napoleon when he created his Continental System by forbidding his empire and allies to trade with the British. However, Russia's best market was Britain and Britain's best source of essential naval stores was Russia.

At the same time, Americans were discovering that the economic warfare between France and Britain was making the ports of all of Europe directly or nearly directly under Napoleon's control very dangerous for American shipping. Even the usually peaceful Danes, for instance, seized several hundred American merchantmen between 1807 and the outbreak of the War of 1812. It was inevitable that Russia, the continental European nation farthest from Napoleon's center of power, would become one of our most important trading partners. In 1811, for example, one tenth of all America's exports went to Russia.

It was also inevitable that many Americans would engage in smuggling goods to and from Russia for the British. And it was inevitable that Britons would disguise their own merchantmen with American flags and papers, and continue direct trade with Russia under false colors.

Thus it was that from 1808 through 1812 the foreign flag most commonly seen in Russia's Baltic and White Sea ports was the Stars and Stripes. In the summer of 1811, for instance, a hundred vessels flying the American flag lay in Kronstadt harbor at one time.

Napoleon sent demand after demand to Tsar Alexander I to halt all trade with American vessels. All Americans, the Corsican claimed, were either British or sailing on British account. From 1809 through the winter of 1812 Napoleon's ambassadors to Russia, Caulaincourt and Lauriston, fought America's minister to Russia, John Quincy Adams, for Alexander's favor. Adams won, because Alexander knew that the bulk of Russia's foreign trade was now being carried in American bottoms. To sever trade relations with the United States would have had a disastrous effect on Russia's already staggering economy.

Probably Russia's lax enforcement of the Continental System against shipping flying the American colors was as important as any other single factor in convincing Napoleon that he must invade Russia, and therefore in bringing the French Empire to wreck upon the white reefs of the Russian winter of 1812.

Microfilm $3.90; Xerox $13.75. 302 pages.

J. HAMPTON MOORE: AN OLD FASHIONED REPUBLICAN.

(Order No. 61-3501)

Robert Edward Drayer, Ph.D.
University of Pennsylvania, 1961

Supervisor: Roy F. Nichols

Early in the twentieth century Lincoln Steffens referred to Philadelphia as "corrupt and contented." The latter half of the phrase was inaccurate since many efforts were made to provide the city with better government. One such civic uprising occurred in 1919 when J. Hampton Moore was elected Mayor for the first time. The new chief executive had served in Congress for thirteen years and was noted as a champion of the protective tariff and the inland waterways movement. He entered City Hall with a determination to become the leader of the local Republican party as well as the chief municipal administrative officer. In 1924 he left office with a solid record of accomplishment behind him. Contractor street cleaning, a lucrative source of revenue for the Vare organization, had been ended and the newly constructed Frankford Elevated Railroad had been leased on fair terms to the Philadelphia Rapid Transit Company. But the Penrose and Vare factions of the party were united after a decade of internecine warfare and Moore himself was a political outsider.

Eight years later he was again elected Mayor and this time he had Vare support. Once again he had the opportunity to give the city real leadership. Philadelphia, like the rest of the country, was in the grip of the Great Depression and the municipal treasury was virtually empty. Moore followed a conservative policy and tried to cut governmental expenditures by every possible means. The electorate however refused to follow him and by the close of his term in 1936 he seemed to be a figure from the past.

The study seeks to throw light on Moore's apparent shift of position on the issue of Vare rule and to show why he was unable during either of his administrations to achieve control of the political situation. An attempt is also made to discover the reasons for the general ineffectiveness of Philadelphia reform movements.

The voluminous Moore collection of papers and scrapbooks on deposit at the Historical Society of Pennsylvania was carefully examined. Philadelphia newspapers of the period from 1919 to 1936, particularly the Philadelphia Public Ledger, were also consulted. Magazine articles in both popular and learned periodicals proved useful as did the memoirs of leading figures of the period. Personal interviews with members of Mr. Moore's family and with political associates of the former Mayor served to bring the picture into sharper focus.

Moore's political difficulties were caused largely by his inability to obtain the sustained support of a strong cohesive group. During his first term lack of patronage caused the Penrose politicians to leave him while his attacks on the civil service provisions of the City Charter alienated the reformers. In the late Twenties he became the leader of the good government forces in Philadelphia but three election defeats in quick succession induced him to make an alliance with Vare. The depression lessened the power of the Republican machine however and its assistance was of little value during the second Moore administration.

Neither Moore nor the Mugwumps ever presented any social or economic program to improve the lot of the underprivileged. The needs of the workingman and the immigrant were met by the organization division committeemen. Only the middle class and the business community were concerned about such matters as an honest vote count and lower real estate taxes. Lack of mass support, the one party system, and the fraudulent manner in which elections were conducted greatly reduced the strength of the Philadelphia reform movement during the pre-New Deal period.

Microfilm $5.55; Xerox $19.60. 433 pages.

FRANCISCO PIMENTEL, HIS LIFE AND TIMES.

(Order No. 61-3876)

Joseph Albert Ellis, Ph.D.
Columbia University, 1961

Nineteenth Century Mexico was a country largely characterized by political anarchy. While the political history of the Mexican nation has been treated extensively by historians from the United States and Mexico, little has been done with the intellectual history of nineteenth century Mexico. This is the story of an intellectual, don Francisco Pimentel, and of the times in which he lived. Through his unceasing academic labors, Pimentel opened new paths for Mexican studies in history, economics, linguistics, literature and sociology. He wrote from a Mexican point of view, with an acute awareness of Mexico's particular needs and problems, of her own roots and traditions.

Francisco Pimentel's work opened the modern period of Mexican intellectual endeavors. His solutions of the problems he examined are for the most part unimportant. Rather it is his approach to these problems for which he is to be remembered. From this time on, Mexico has been studied increasingly from the point of view of the realities

of her own situation, and not from European or American considerations of what Mexico ought to be. The recognition Francisco Pimentel deserves for this contribution has not been forthcoming. As a representative nationalist of the latter nineteenth century, he gave impetus to Mexican studies in unexplored areas.

That Francisco Pimentel, given his family and background, should be the one to break with the past is an interesting point. The landed aristocracy, to which the Pimentel family belonged, was then, as now, largely absorbed in social activities and the protection of its own economic and political interests. Francisco Pimentel used his financial means to free him for a life of study. He was an intellectual recluse, who maintained a set circle of friends throughout his life and who, except for one brief but tragic period, isolated himself from the ambiguities of Mexican politics.

This is one reason why studies of Francisco Pimentel so long have been neglected. Most Mexican literary figures of the nineteenth century were active politically, either as liberals or conservatives. By contrast, Francisco Pimentel's life was publicly uneventful for the most part, inspired principally by a scholarly concern for the state of the Mexican cultural and intellectual world. By and large, Pimentel was a colorless creature of habit and pedantic routine, with strong family ties and little concern for his business fortunes. His quest for stability and peace in the institutions of the Mexican nation became an obsession. It would lead to the support of a Maximilian or a Díaz.

Pimentel was an intellectually honest man who sought to understand the Mexican nation for what it was. In this fact lies his greatness. Forgotten as he was by his own and succeeding generations, it is only recently that North American and Mexican historians have examined his writings with fresh recognition of the important insight they provide into Mexican thought. This study is an attempt to aid in an understanding of Francisco Pimentel, his interests and contradictions, his life and thought, the age in which he lived.

Microfilm $3.15; Xerox $11.05. 242 pages.

THE IMAGE OF THE CHINESE IN THE UNITED STATES, 1885-1915.

(Order No. 61-3512)

John Berdan Gardner, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Robert E. Spiller

This study explores the paradoxes in American-Chinese relations between 1885 and 1915 which found Americans simultaneously fearful and contemptuous of the Chinese yet confident of a favored role as China's friend and benefactor. Comparison of descriptions found in American periodicals of the Chinese known in the United States with the image of the Chinese appearing in travel literature and descriptions of China reveals a similar figure, alien, heathen, backward, dangerous. This image, given political force in the Chinese Exclusion Acts, resulted from familiarity with the Chinese in America, particularly in Chinatowns, and with cliches about the Chinaman's being either "the heathen Chinee" or a Mongolian coolie to be feared as labor competition.

The image permitted Americans to formulate three major conceptions of the Chinese in China. Coupling the dangerous aspects of the image with a vague but widely publicized notion of 400,000,000 Chinese living in China, Americans variously thought of the Chinese as the "yellow peril" and as heathen to be converted to Christianity. Other ingredients of the image encouraged a dream of 400,000,000 Chinese customers. It is testimony to the strength of the image and to American ignorance of China that Americans should fear the "peril" despite the Exclusion Laws and the Pacific Ocean; that Americans should imagine the Chinaman as customer, despite his poverty; that Americans should envision Christianizing the Chinaman, despite reflections in missionaries' writings of unfavorable attitudes toward him which were bound to insure few converts.

The demands of American ideas having nothing to do with China found ingredients in the image which permitted the three major conceptions of China to exist as myths. That is, Darwinist thought seized upon parts of the image to create the myth of the "yellow peril" as Americans worried over preservation of Anglo-Saxon supremacy. Darwinist thought also led to the idea of Christianizing 400,000,000 heathen as part of the "white man's burden." Moreover, both fears of an American trade surplus and belief in the idea of progress made it easy for Americans to project the idea of the Chinese as customers.

The contempt, fear, and hatred of the Chinese expressed in the popular image existed until 1915, although some Americans sought to defend the Chinese and to correct American misconceptions of China. If Americans could be somewhat complacent about their role in China after 1900, this circumstance resulted from pressures in the United States which also had little specific connection with the Chinese. The rise of the Social Gospel and the humanitarianism and philanthropy characteristic of the Progressive Era had their effects in China. Funds creating Chinese hospitals and educational institutions substituted for much of the evangelization demanded by the myth of 400,000,000 Chinese waiting to be Christianized. Moreover, the political gestures of the Open Door policy and the remission of the Boxer indemnity became symbols of American altruism. But both American philanthropy in China and these political gestures enabled Americans to avoid the cultural conflicts implicit in the image.

The habits of the American mind which Professor Henry Nash Smith describes in Virgin Land are present in American thinking about the Chinese. But instead of the myth of the "Garden of the World," Americans created the myths of the Chinese as customers and as heathen to be Christianized. The image of the Chinaman, like the ideal of the yeoman farmer, was largely an imaginative construct. When fused with American ideology, myths resulted which were conceptions of the Chinese and of America's role in China bearing little relation to actuality in the years 1885 to 1915.

Microfilm $3.05; Xerox $10.60. 233 pages.

THE PARLEMENT OF PARIS DURING THE REGENCY, 1715-1723.

(Order No. 61-3521)

James Daniel Hardy, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Otakar Odlozilik, Ph.D.

There is an immense wealth of manuscript material in the archives of the Parlement of Paris in the Archives Nationale de France. In addition to this material, I have used numerous memoirs and journals kept by contemporaries of the events I have described. I have used these two main sources, as well as secondary sources, in reconstructing the politics of the Parlement of Paris during the regency.

Louis XIV died on September 1, 1715, bequeathing to his successor a political situation of great uncertainty. Military defeat had undermined the political and economic basis of absolutism. As Louis XV was a child, a regency was necessary. A contest for power in the regency arose between the duc d'Orléans and the duc du Maine, the natural son of Louis XIV. By judicial concessions of royal power to the Parlement, particularly the right to remonstrate, the duc d'Orléans was declared regent with full power by the Parlement.

During the regency of the duc d'Orléans the Parlement of Paris was engaged in a running political battle with the regent and his ministers. Having won the right of remonstrance, the Parlement wished to enlarge its political power. It wished to follow a conservative financial policy and sustain the Gallican liberties. Each brought a conflict with the regent.

The Parlement attempted to increase its power by enlarging the sphere of its right of remonstrance. It attempted to make its registration necessary to the legality of edicts and tried to win acceptance of its claim to be the voice of the people. These pretentions were quashed by the lit de justice and the arrest of the three magistrates in August, 1718, and the exile of the Parlement to Pontoise in 1720.

The Parlement's attempt to follow a conservative financial policy and thwart the system of John Law was similarly treated. The lit de justice of August, 1718, and the exile to Pontoise smashed the Parlement's two attempts to wreck John Law's system.

During the earlier part of the regency the Parlement and the regent agreed on a policy of defending the Gallican liberties. However, this caused a wide split in the French Church; and in 1719, urged on by abbé Dubois, the regent abandoned Gallicanism. In September, 1720, he sent to the Parlement, already exiled to Pontoise for opposition to John Law, an edict establishing the ultramontane position in France. Only when the regent threatened the Parlement with total destruction, did the Court register the edict and abandon the Gallican liberties.

Thus, in the various struggles for power, the regent was the victor. The focus of power was definitely with the government. However, the Parlement never lost the right of remonstrance, its entering wedge into the political realm. No attempt was made to revert to the absolutism of Louis XIV.

As for the Parlement, it never lost sight of the goal of a permanent and powerful political position where it could impose its policies on the nation. During the regency the Parlement never won this position. It, also, never lost sight of it. Its goal was power; its politics reflected that goal. Microfilm $3.65; Xerox $12.85. 282 pages.

ANTE-BELLUM ATHENS AND CLARKE COUNTY, GEORGIA.

(Order No. 61-3831)

Ernest C. Hynds, Jr., Ph.D.
University of Georgia, 1961

Supervisor: Joseph H. Parks

This dissertation seeks to show how Clarke County progressed from its founding in 1801 until the Civil War. Special emphasis is given to Athens and the University of Georgia because of the major roles they played in the transition.

The county grew slowly, then blossomed in many areas. Once the university became firmly established in the 1820s, Athens business began to prosper and expand. By 1840 the town had forty-five stores with a capital investment of $88,000, and by 1860 it had more than sixty stores with a capital investment of $430,000. This facilitated the development of manufacturing. Principally because of three cotton manufactories originated in the 1830s, the county ranked second in capital invested in industry in 1840; it continued among the top ten in Georgia throughout the ante-bellum period.

Athens residents were instrumental in founding the state's first great railroad, the Georgia Railroad; but unfortunately for them that road's main line was extended from Augusta past Athens to join the Western and Atlantic. Thus Atlanta and not Athens became the great railroad hub of the Southeast. Clarke County was never a leader in agriculture, although considerable cotton and other crops were produced. The slave system was installed, and in the later ante-bellum decades more than half the total population was slave. Most of them were treated fairly well.

Probably because of its business and manufacturing development, and the presence of the university and many planters in Athens, Clarke County generally was conservative in politics. At various times the Troup, Whig, Union, and American parties were in the ascendancy. The Inferior Court remained the primary unit of county government, but Athens shifted from a commission to intendant and warden system in the late 1840s.

Clarke County citizens were better educated than most in Georgia. The county ranked high in the amount spent on education, the number of schools, and the number of students. Education and public affairs were stimulated by the newspapers founded in Athens. During the later years the city had outstanding papers of both major political parties. Several important magazines were also published there.

By 1850 Clarke County had at least twenty churches, half of which were Methodist. Athens had Baptist, Episcopal, Methodist, and Presbyterian churches. Considerable religious fervor was noted in camp meetings, revivals, and similar programs.

The county's progress was not hindered by war or epidemic, and by 1860 it was a state leader in education, manufacturing, business, and other fields.

Microfilm $5.40; Xerox $19.15. 424 pages.

THE ENCYCLOPEDISTS AND THE FRENCH REVOLUTION

(Order No. 61-3440)

Frank Arthur Kafker, Ph.D.
Columbia University, 1961

The word "Encyclopedist" is misused almost as often as it is used. People cannot agree on whether the contributors to Diderot's Encyclopedia were aristocrats or bourgeois, deists or atheists, visionaries or realists, admirers of enlightened despotism or democrats, reformers or revolutionaries. Even so eminent a historian as Georges Lefebvre and so eminent a philosopher as Ernst Cassirer generalize about all the Encyclopedists after having considered only a few of the most famous ones in the Old Regime.

This study tries to estimate the political temperament of the Encyclopedists by a different method: namely, by describing the thoughts and actions of those forty-nine who were still living during the French Revolution. Like their fellow contributors who died before the Revolution, they have been acclaimed or vilified for helping to cause the revolt; but no one has examined their lives from 1787 to 1815 to find out whether they sought to overturn the Old Regime or only to reform it.

The preface shows "the surviving Encyclopedists" to be typical of most other Encyclopedists. This varied group, some one-third to one-quarter of all the Encyclopedists, had helped to shape nearly every important section of the Encyclopedia. They were also vigorous and productive during the Revolution: sixteen worked for the administration; nine others published pamphlets or books; four more were legislators; one was a diplomat and another the brother of a minister.

Successive chapters discuss whether the Encyclopedia itself sought to incite armed revolt, whether the Encyclopedists were a party in the Old Regime, whether the surviving Encyclopedists were plotters from 1787 to 1789, whether they were revolutionary theorists and doctrinaires from 1789 to 1791, whether they were Girondins from 1791 to 1793, whether they were Terrorists from 1793 to 1794, and whether they were moderates from 1794 to 1815.

We find that in the Old Regime the Encyclopedists loathed violence and did not have the temperaments of embattled revolutionaries. They belittled unreasonable customs, weakened the might of the Church, and undermined that of the king without hoping or knowing that this would serve as a rallying cry for those who sought a political rather than an intellectual revolution. From 1787 to 1799 some half of the surviving Encyclopedists remained monarchists, though only one or two conspired against the revolutionary government. Among the half who became republicans, there were a few zealous revolutionaries, but none was a Girondin when the Girondins were in power or a Jacobin when the Jacobins were in power. One contributor did sympathize with the Enragés, but only during the early phases of the Revolution. By 1799, after ten years of turbulence, nearly all of the two dozen contributors still alive supported Napoleon. Far from being radicals, the forty-nine surviving Encyclopedists were, like most of their dead colleagues, not bellicose, but moderate.

Microfilm $2.85; Xerox $9.90. 219 pages.

THE TRADITIONAL JEWISH SERMON IN THE UNITED STATES FROM ITS BEGINNINGS TO THE FIRST WORLD WAR

(Order No. 61-3715)

Nathan M. Kaganoff, Ph.D.
The American University, 1961

Existing scholarship on the history of the American Jewish community is limited almost entirely to the Colonial and Civil War periods and select aspects of Jewish life in the late nineteenth and twentieth centuries. The impact of the American environment on Jewish religious life and thought have been largely ignored. As a contribution to this somewhat neglected field, this study attempts to trace the development of the traditional Jewish sermon in the United States from its beginnings to the outbreak of the first World War. The conclusions reached are based upon an analysis of extant manuscript and published sermons and references to preaching found in the contemporary Jewish press and other works devoted to the history of the American Jewish community.

Through the second decade of the nineteenth century, the sermon in the traditional synagogue in America was uncommon and considered an element foreign to the religious service. Occasional preaching did take place either when a visiting rabbi arrived to solicit funds for charitable institutions in Palestine or Europe, and more often, when an event of great local significance occurred, usually of a patriotic nature, when the Jewish community was eager to show its loyalty to its adopted country. In these latter instances the sermon was most often delivered in English by gifted laymen.

Beginning with the 1830's, the demand for synagogue preaching increased, aided in part by the position of preaching in the Protestant church, and in part by the prodding of religious leaders who saw in preaching a means whereby the American Jew could be kept loyal to his ancestral faith. The large Jewish migration from Central Europe which began at this time brought ordained rabbis who were able to supply this need, but never in sufficient quantity to meet the demand. Laymen, therefore, continued to serve as preachers, and the Jewish sermon differed little from its Christian counterpart, stripped of theological dogma.

Eastern European Jews began to arrive in the United States in some number in the period preceding the Civil War and brought with them the institution of magid and the casuistic derashah to which they had been accustomed. The influx of two-million Eastern European Jews between 1881 and 1915 precluded any normal pattern of absorption or adjustment to American life, and there thus existed two types of traditional sermons -- the ethical exhortation of the Americanized community and the derashah in Yiddish of the immigrant.

In time, conditions began to change. As the political and scientific atmosphere made great inroads into traditional Jewish life, the two groups joined forces in an effort to combat a common enemy, and a new type of traditional Jewish sermon emerged which contained the worthwhile features of both types of preaching and which was regarded as a function which could only be discharged by an ordained rabbi. This is the type of sermon still delivered among traditional Jews in the United States today.

Microfilm $2.90; Xerox $10.15. 224 pages.

THE GANSEVOORTS OF ALBANY AND ANGLO-DUTCH RELATIONS IN THE UPPER HUDSON VALLEY, 1664-1790.

(Order No. 61-3445)

Alice Patricia Kenney, Ph.D.
Columbia University, 1961

The story of the Gansevoorts of Albany is significant because it reveals the response to English rule of four generations of a typical Dutch family in the upper Hudson Valley. None of the Gansevoorts were famous or widely influential as individuals, but they may be considered typical, if not representative, of numerous early Dutch families in the area. Their story, gleaned from public records, manuscripts in libraries in Albany and New York, and newly-discovered private papers, provides fresh insight into the activities and attitudes of the common people of the colonial period.

Harmen Harmense van Gansevoort (ca. 1635-1710) came to America from the Netherlands or nearby Germany in the 1650's. Arriving without family connections or financial resources, he worked for a brewer and tried to farm. About 1670, when he married, he established a brewery in Albany and thenceforth prospered. His lawsuits in the local court were typical and demonstrate how English practice became established there. His leadership among the Albany Leislerians determined his descendants' political alignment for the rest of the colonial period.

Harmen's only son Leendert (1683-1763) continued to operate the brewery, and thus accumulated sufficient wealth to live in some luxury, to invest in mortgages and to speculate in wild lands. In the 1730's he sat on the Albany Common Council, where he worked amicably with English leaders not only for the public benefit but also for their private advantage, securing land grants.

Leendert's eldest son Harme (1712-1801) became a merchant trading with London. During the French and Indian War, bad feeling arose between Albany Dutch merchants and British contractors and army officers. This came home to the Gansevoorts when Harme was forced out of his office of Town Clerk by Witham Marsh, an English politician. Marsh had a strong legal claim to the position, but his officious attitude toward Harme and toward the Dutch in general created much bitterness in Albany.

Harme's sons Peter (1749-1812) and Leonard (1751-1810) and their cousin Leonard Gansevoort jr. (1754-1834) all became ardent Patriots. Leonard, a lawyer and politician, was elected to local and provincial offices. Peter joined the army and was in command at Fort Stanwix during the 1777 seige. Leonard jr. became secretary to a committee investigating Loyalists. After the war, Peter bought and developed forfeited lands, Leonard became a merchant and Leonard jr. practiced law. All three became members of the faction headed by their cousin General Philip Schuyler and worked hard for the adoption of the Constitution.

The Gansevoorts' history shows how descendants of Dutch settlers in the upper Hudson Valley responded to the English conquest. During the seventeenth century, they submitted to English rule and law, but they did not make direct commercial ties with London until the eighteenth century. They continued to speak the Dutch language, but its use became increasingly restricted with the coming of the Revolutionary years. When in 1788 the Dutch Reformed Church abandoned the language of the homeland, the Dutch community lost its last bond unity.

The Gansevoorts' political alignments provide insight into factional differences in colonial Albany. Family relationships as much as issues produced opposing groups among the Dutch which included individual Englishmen. Only with the French and Indian War did animosity arise between Dutch and English. This ill-feeling, however, contributed to the ardent Patriotism of many Dutch during the Revolution. After the war the old factions reappeared and determined party alignments over the Constitution.

Thus this case study of a typical Dutch family illuminates the interaction between Dutch and English culture in colonial America and the formation of the subsequent cultural amalgamation to which later immigrants were expected to adjust.

Microfilm $3.05; Xerox $11.25. 248 pages.

THE AMERICAN DISCUSSION OF GENIUS IN THE NINETEENTH AND TWENTIETH CENTURIES

(Order No. 61-3128)

Gretchen von Loewe Kreuter, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Merle Curti

Historically, the idea of genius has always been associated with extraordinary creative achievement. In European thought, the idea became a significant component of romantic ideology in the nineteenth century, and from diverse thinkers, two related conceptions of genius emerged. One, the artistic genius, was a creator who depended not upon reason or rules for his successes, but upon intuition, imagination, and inspiration. He owed nothing to society, and education could not improve his inborn gifts. The second variety, the active genius, shared this reliance upon non-rational qualities of mind and was likewise independent of the forms of political and social life.

In America, the initial indigenous stimulus to the discussion of genius was cultural nationalism, which induced men to examine the idea of excellence and try to discover what factors helped or hindered its achievement. It was widely believed that the American democracy ought to be especially favorable to genius, because freedom, according to romantic theory, was the first necessity of the truly creative mind.

The New England Transcendentalists were the first Americans to make the idea of genius central to their view of both leadership and creativity. At the same time, a new concern developed among most other men of letters: perhaps the freedom so lauded by the romantics would be carried over by the genius into the sphere of morals; perhaps his audience would think that such license was permitted to them. Anarchy, these literati feared, could be the only result; and so they began to insist that character, virtue and hard work are vastly superior to genius, and that ordinary folk must be ever on their guard lest they be led astray by the evil genius.

A new element in the American discussion of genius became evident toward the middle of the nineteenth century. The romantic view had assumed that the genius was qualitatively different from other men. Now, however, there arose the idea that the genius was merely the top of a continuum of human intellectual ability. It was the phrenologists who first suggested that the genius differed only quantitatively from the rest of mankind, and that the term genius might be applied to excellence in any field.

The quantitative definition of genius reached its climax in the work of the mental testers in the twentieth century. Although they were reluctant to admit it, their experiments showed that the intelligence quotient was not the sole and sufficient indicator of what had been historically called genius. Many psychologists declared, therefore, that genius was no longer a meaningful concept. At the same time other Americans took the same view of genius for quite different reasons: discipline and the mastery of one's craft, they said, have ever been the determinants of excellence in creative achievement.

By the mid-twentieth century, it seemed that the most fruitful insights into genius were those being derived from psychoanalytic thought. Nevertheless, developments in the social sciences -- the work of A. L. Kroeber, for example -- made it clear that the individual approach to genius still left many questions unanswered.

The most obvious single development in the idea of genius over two centuries has been its gradual loss of supernatural and mystical connotations, and the growth of the conviction that creativity, inspiration, and imagination will one day be understood according to the methods of science. Experience has not yet borne out that conviction, and it seems from the work being done in the sciences of the mind, that the time has not yet come to abandon all of the romantic assumptions about the individual of extraordinary creative ability.

Microfilm $4.80; Xerox $16.90. 373 pages.

KARL RADEK ON WORLD REVOLUTION: A STUDY IN REVOLUTIONARY STRATEGY AND TACTICS.

(Order No. 61-3890)

Warren Lerner, Ph.D.
Columbia University, 1961

This study has been planned as the initial step in what eventually will be a full-scale political biography of Karl Radek (1885-1939), one of the leading figures of the Third International. The study is specifically concerned with Radek's approach to the problem of world revolution and his development of strategy and tactics for the achievement of this goal.

As a young man Radek joined the Polish socialist movement in 1904. The Russian Revolution of 1905 convinced him that revolution was the only course of action open to European workers, and he devoted his political career to the fostering of a world revolution which would establish a socialist order. In the decade following the Russian Revolution of 1905, Radek regarded Europe as being on the brink of revolution and concentrated on preparatory tactics for this imminent revolution. At first in Poland, and after 1908 in Germany, he headed a violent and vitriolic attack against revisionist socialists who he believed undermined the inherent revolutionary drive of the proletariat. These attacks earned Radek a decided reputation but they also resulted in his expulsion from the German Social Democratic Party in 1913.

World War I forced Radek to emigrate to Switzerland where he continued to agitate for an all-European uprising of the proletariat. In Switzerland he also became involved in the Zimmerwald Left, an organization of revolutionary socialists led by V. I. Lenin. In 1917, unable to accompany Lenin into Russia, Radek maintained an overseas Bolshevik office in Stockholm and then promptly proceeded to Russia after the Bolshevik Revolution. One of his first tasks for the new regime was to encourage a proletarian revolution in Germany. However, as a result of the failure of the Spartakusputsch of 1919, Radek became obsessed with the necessity of preventing premature revolutionary action and became considerably more cautious in his revolutionary strategy. After spending several months in a German jail, Radek returned to Moscow in 1920 and attempted to win Lenin over to this new strategy of caution. In the same year, Radek was also appointed secretary of the Third International, or Comintern, and in this capacity, during the years 1920-1923, he reached the peak of his power and influence. He devised several of the Comintern's basic revolutionary tactics of the period, most notably the tactic of the "united front."

After 1923 Radek's political activities became identified with the "Opposition" led by Leon Trotskii. As a result, Radek lost much of his influence and was relegated to an academic post in a new university for Chinese students in Moscow. He utilized his new position to become an Opposition "expert" on China, but he was no longer in a position to influence Comintern policy. When he attacked Stalin's doctrine of "socialism in one country," Radek shared Trotskii's fate of exile to Siberia in 1927. After a year and a half in Tobolsk, Radek reconciled himself to Stalin's domination of the Bolshevik party by recanting and denouncing Trotskii. This action purchased another seven years of prominence for Radek but not at the same level he had enjoyed in the heyday of the Comintern. Moreover, subservience to Stalin was insufficient to insure Radek's permanent rehabilitation, for in 1937 he was sentenced to imprisonment for Trotskyite activities and he died in prison in 1939.

Microfilm $3.70; Xerox $12.85. 285 pages.

THE KING'S REPRESENTATIVE: BENNING WENTWORTH, COLONIAL GOVERNOR, 1741-1767.

(Order No. 61-3965)

John Francis Looney, Ph.D.
Lehigh University, 1961

Benning Wentworth had a two-fold task to perform during his twenty-five years in office. As an imperial administrator, he was commanded to restore, strengthen, and preserve the royal prerogative of the crown, and make it palatable to the people of New Hampshire. As governor of this tiny province, he was expected to rescue it from deterioration and place it upon a sound financial and economic basis to make it a flourishing and useful member of the empire. The difficulty in performing this task became especially evident in his function as surveyor of the King's woods, since New Hampshire had hitherto paid scant attention to the masting regulations, and whose major staple of export and source of wealth derived from lumber. Benning Wentworth set about to restore royal authority in New Hampshire, and the prosperity of the province, with the avowed intention of placing his family in the position of chief dispensers of the one and principal recipients of the other.

His public and private correspondence, and that of his friends and relatives in high government circles, indicate the degree of success in promoting the interests of crown, colony, and family. He sought to free the executive from financial dependence upon the assembly by extracting from it a permanent salary grant. He failed in this, and the two wars which consumed half of his administration, served to jeopardize further the prerogative and weaken his position as an imperial administrator. Wentworth possessed outside sources of income which enabled him to act with a minimum dependence upon the assembly, and between the wars, he fought its encroachments upon the prerogative and won a sweeping victory for the crown.

Once royal authority became firmly established, Wentworth directed his attention to revitalizing provincial trade and expanding his territorial limits. He claimed all the land west to New York and promoted its rapid settlement by selling it cheaply. He maintained the primacy of Portsmouth as a commercial center and tapped the rich forests along the Connecticut Valley by linking the coast and hinterland with roads. Since lumber was the most important exportable staple of New Hampshire, Wentworth used his office as surveyor to stifle competition from the neighboring colonies. He refused to permit removal of obstructions in the Merrimack River to prevent timber from entering Massachusetts ports. He prevented Connecticut from poaching on his western timber lands, and persuaded the Board of Trade that the Connecticut River was not a fit conveyance for getting masts to port. The virgin territory of Maine, and the accessibility of its timber to water, posed a serious threat to the lumbering interests in New Hampshire, and Wentworth attempted to remove it by urging that Maine be turned into a nursery for the royal navy.

Wentworth placed his relatives in every important provincial office and made them the largest landholders in New Hampshire. The assemblymen also possessed considerable holdings and their susceptibility to this form of bribery was particularly useful during the storm over stamps because New Hampshire was seeking a favorable determination of its western boundary and reimbursement for the past war. Wentworth persuaded the assembly not to participate in the Stamp Act Congress, and the governor, council, and assembly worked harmoniously during the crisis to maintain the appearance of a loyal and peaceful province.

It was a difficult task to administer to the interests of crown, colony, and family concurrently to the satisfaction of all concerned and to reconcile them. Yet Wentworth did reconcile them, and though there was general dissatisfaction from all by 1767, nevertheless each had come to occupy vastly better circumstances than at any previous time. Microfilm $2.90; Xerox $10.15. 221 pages.

RUSSIAN PARTICIPATION IN THE SECOND INTERNATIONAL, 1889-1914.

(Order No. 61-3374)

George Douglas Nicoll, Ph.D.
Boston University Graduate School, 1961

Major Professor: Frank Nowak

The modern international socialist movement experienced its infancy and childhood in the form of the International Working Men's Association, or First International (1864-1876). Its maturity seems to have been reached in the wake of the successful Bolshevik Revolution of 1917 with the founding of the Third International, or Comintern, and the expansion of Marxism-Leninism throughout the world under Soviet leadership. The period between these two phases, the adolescence of international socialism, was the period of the Second International (1889-1914). During this period the socialist movement rose upon its earlier foundations and became a significant social and political force in almost every European nation. At the same time the Russian revolutionary socialist movement was growing within the tsarist empire and among its exiles. While Russian Socialists were developing the strength necessary to overthrow the tsarist regime, they also participated in the Second International. Since no systematic study has been made of the interrelationship between the Second International and the Russian Radicalism of the late nineteenth and early twentieth centuries, this dissertation seeks to demonstrate the extent and nature of Russian participation in the Second International.

This study reveals a certain degree of Russian independence from the main stream of European socialism. The Russians stood in opposition to reformism both in theory and in practice. This opposition was due, in part, to the particular state of Russian political and economic growth. As the Russians became aware of the reformist nature of the actions of their international comrades, they became critical of the activities of the Second International. In their response to the outbreak of World War I the Russians did not differ too greatly from other Socialists, but as the Russian socialist movement became increasingly dominated by the Bolsheviks, who stood clearly apart from the leaders of the International on the issue of the war, the independence of the Russians became apparent. These observations suggest that whenever the main stream of

thought and action in the Second International ran counter to the basic interests and attitudes of Russian socialism, the Russians assumed a position independent of that main stream. This independence explains, in part, the relative unimportance of the Russians as a group in the Second International. It also suggests what the nature of the relationship of Russian socialism to the International socialist movement would be in the years following the Second International. Most Russian Socialists divorced themselves from any effort to revive the Second International and supported the Bolshevik-dominated Third International, which was not a representative of international socialism but an instrument and protector of Russian communism.

In the Second International the Russian participants assumed their most active role in the open discussions of the congresses and meetings only when the issues directly affected them or were irrelevant to conditions in Russia. It is impossible to rank the contribution of the Russians as a national group, because aside from the Germans and the French, the important roles in the Second International were played by individuals.

The primary sources used in this study include the available documents and records of the Second International. This means primarily the records of the congresses of the International, direct reports of the activities of the Second International and its participants, and the pertinent memoirs of its leading figures. The records of the International Socialist Bureau have been lost. Valuable secondary sources were the significant studies of international socialism, the Second International, and the Russian revolutionary movement. Virtually all relevant material is available in the libraries of the United States.

Microfilm $3.20; Xerox $11.25. 248 pages.

FRONTIER GOVERNORS; A STUDY OF THE TERRITORIAL EXECUTIVES IN THE HISTORY OF WASHINGTON, IDAHO, MONTANA, WYOMING AND DAKOTA TERRITORIES.

(Order No. 61-3700)

Kenneth Nelson Owens, Ph.D.
University of Minnesota, 1959

Adviser: David W. Noble

This study of the governors in the far northwestern territories during the latter half of the nineteenth century examines the operation of territorial government through the careers of the executives appointed by the successive national administrations to serve as the leaders of the political and administrative life within these territories. The governors were appointed as politicians above all, and this study reveals that their political role was most often the dominant factor in shaping territorial policies. For the most part they shared their generation's faith in the economic as well as the political progress of the western regions. The governors sometimes occupied a crucial position in the struggles for advantage between local and regional interests, in addition to their prominence in the party battles which formed the normal institutional framework for territorial government.

The enterprising frontiersmen in the far northwest, like their contemporaries in the states, believed local self-government to be one of their most basic rights. During the early development of the western territories, while the national administrations were distracted by the sectional crisis, Civil War, and then the immediate problems of reconstruction, federal territorial policy hinged upon patronage considerations. With some notable exceptions, the men appointed to govern the new territories created to meet the needs of a rapidly moving frontier population were outsiders, given office in recognition of political services in the midwest and east. These early governors, however, often played a commanding part in the initial development of western political institutions, attempting to harmonize local policies with those of the federal administrations, though the officials in the national capital exercised only a very small degree of direct control.

For President Grant and his Republican successors, the distribution of the patronage continued as the prime concern in territorial matters, and the disharmony within the various territorial Republican organizations confirmed these Presidents in the general policy of appointing nonresident officers. The territorial governors during the 1870's and early 1880's, however, were increasingly faced with the necessity of adapting their political and administrative activities to the forceful demands of established local interests. Control of the typical great western enterprises was rapidly concentrated in the hands of a successful few, and many of these same men were also emerging as the leaders of the territorial political organizations. The governors had either to conciliate these western leaders or face violent opposition and eventual political oblivion, since the federal authorities demonstrated an increasing reluctance to refute the still potent theory of territorial autonomy.

The demand of western men for a larger voice in determining local matters led President Cleveland to reverse the usual appointment policy, and his appointments to the governorships generally confirmed in power the successful capitalists who were coming to dominate the political as well as the economic life of the northwest. Though these men often used their official position to oppose the reforming aims of the national administration, they demonstrated convincingly the readiness of these northwestern regions for full political recognition as states. As the success of the Omnibus Statehood movement promised an end to the territorial period in the northwest, President Harrison drastically redistributed the federal patronage in a final scramble for party advantage. But whether Republican or Democratic, the men who had achieved leadership in western affairs, as demonstrated by the careers of the final territorial governors, proved the dominance of western wealth and influence rather than any levelling spirit of frontier democracy.

Microfilm $5.00; Xerox $17.80. 391 pages.

PROPRIETARY NORTH CAROLINA: A STUDY IN COLONIAL GOVERNMENT.

(Order No. 61-3180)

Herbert Richard Paschal, Jr., Ph.D.
The University of North Carolina, 1961

Supervisor: Hugh Talmage Lefler

This study traces the development of the provincial government in North Carolina from its establishment under the Lords Proprietors of Carolina in 1663 until the colony passed under royal control in 1729. It shows in detail the manner in which each of the various offices and agencies in the colony emerged out of the forms of government which the Lords Proprietors introduced and the activities of the provincial government in those areas in which it was most concerned.

Although the region which became North Carolina was the first portion of the New World to be explored, mapped, and described in detail by the English, it was not permanently settled until 1660 or 1661. Even then these early settlements did not represent a conscious effort to found a new colony but came about as the result of a normal expansion of the Virginia frontier by settlers interested in acquiring some of the rich lands about Albemarle Sound.

In 1663 eight important Restoration figures, led by the wealthy royalist, Sir John Colleton, obtained a proprietary charter from Charles II which established the province of Carolina. This charter and a subsequent charter in 1665 gave these eight men, styled Lords Proprietors of Carolina, virtually absolute control over the soil and government of the region lying between 36° 30' on the north and 29° on the south. Within a few months after receiving their charter the Lords Proprietors created Albemarle County in the northeast portion of their province to embrace the settlements about Albemarle Sound. At the same time a government was established which closely resembled that of Virginia. It was out of this settlement that the colony of North Carolina grew.

Throughout the sixty-six years during which the Proprietors possessed Carolina, they were constantly experimenting with all phases of its government. This experimentation took many forms and was occasioned largely by the Proprietors consuming desire to realize a profit from their province. Their most famous experiment was the effort to establish the Fundamental Constitutions as the basic form of government for their colony. This document had as its purpose the creation of a perfectly balanced feudal society in the wilderness of the New World, but its effect was to create confusion, uncertainty, and suspicion. In Albemarle County where an adequate government was already functioning its partial implementation destroyed much of the power of the General Assembly and checked its development for a quarter of a century. At a time when a strong governor was needed the Fundamental Constitutions created what in effect was a plural executive by reducing the governor to a position of first among equals in his relationship to his council.

These and other unacceptable features of the Proprietors' unique experiment in government led gradually to its abandonment. By the close of the proprietary period the North Carolina government had shed all but a few faint vestiges of the Constitutions and had returned to a government closely paralleling that of Virginia.

While the Proprietors' experiments in government failed for the most part and while their efforts to show a profit failed altogether, a workable form of government gradually emerged out of the experience of the people of the colony. Microfilm $8.30; Xerox $29.50. 655 pages.

THE MAJOR PROPHETS OF RUSSIAN PEASANT SOCIALISM; A STUDY IN THE SOCIAL THOUGHT OF N. K. MIKHAILOVSKII AND V. M. CHERNOV.

(Order No. 61-3465)

Francis Ballard Randall, Ph.D.
Columbia University, 1961

N. K. Mikhailovskii (1843-1904) was a journalist, philosopher, and sociologist, while V. M. Chernov (1873-1952) was also the leader of the Socialist Revolutionary Party from 1902 through the Revolution. Yet both master and disciple were in the same tradition of critical populism and democratic humanism, whose failure after 1917 did not cancel its earlier influence or its abiding insights. Both were men of mild character. Both opposed all dogmatic modes of thought, especially the Hegelian and Marxist traditions, and both insisted on open-mindedness and intellectual freedom. Both men maintained that the human individual has an active role in the knowledge-process, that causality must not be interpreted mechanically, that the natural world is not as deterministic as many contemporaries thought, and that men are genuinely free to make effective ethical choices in private and public life. Both subscribed to Mikhailovskii's theory of "integral personality": each human individual -- conscious, able to suffer and enjoy, think and act -- is a moral end-in-himself; each person should develop all his many-sided potentialities as fully as possible, until all men become super-Michelangelos; all social and political arrangements should conduce to this end. In earliest times, each savage performed the whole range of life's activities for himself, achieving integral personality on a low level. But the increasing complexity of technology and society has progressively reduced each man to a tiny cog in a huge machine, fragmented in life, in outlook, and in soul; this degeneration must be reversed when society and the individual are renovated.

Mikhailovskii usually opposed violence -- whether in war, revolution, or the terrorism of his own day. Chernov was more apt to consent to terror as a means to achieve socialism. Both men believed that the Russian peasant lived a more primitive and hence well-rounded life, a more communal, fraternal, and hence moral life, than other Russians or Europeans, although they eschewed the peasant-worship of many contemporaries. Both believed that the peasant commune, the peasant joint workshop, and the peasant's cooperative habits were priceless moral survivals of primitive socialism, which should not be destroyed by competitive, divisive capitalism from Western Europe. Both held that the Tsarist state machine, and all other Leviathan states, should be dismantled after the revolution, to give way to small-scale, local, cooperative, and largely non-coercive community governments. But Chernov wanted a well-organized (but democratic) and efficient Socialist

Revolutionary Party in Russia to bring on and manage the revolution. Mikhailovskii believed (rightly) that he lived in a pre-revolutionary generation, and that his function was not to detail plans and organize revolutionary groups, but to educate the younger generation in free, democratic, populist, humanist values. But Chernov believed (rightly) that the Russian revolution would come in his time, and worked out his two-stage programme for his Socialist Revolutionary Party: 1, the "minimum program" of ending Tsarism, establishing a bourgeois democracy, and preserving the peasantry from capitalist contamination; 2, the "maximum program" of building voluntary, socialist cooperatives of an advanced type throughout the countryside, and then setting up a loose socialist government in the capitals, and turning the cities, too, into a network of voluntary cooperatives. Chernov stuck to this program through the pre-War and War years, and tried to implement it as Minister of Agriculture in the Provisional Government of 1917. After 1918, Chernov fell back into exile and, eventually, despair. Withal, the humanist populism of Mikhailovskii and Chernov, and their tragic struggle, illuminate the continuing intellectual and social problems of the modern world.

Microfilm $3.80; Xerox $13.50. 296 pages.

SIR JAMES HUDSON AND THE UNIFICATION OF ITALY, 1858-1861.

(Order No. 61-3553)

William George Shelton, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Lynn Case

The purpose of this study is to determine the part played in the unification of Italy by the British minister to the kingdom of Sardinia, Sir James Hudson, and to assess his contribution to the diplomacy of his country during this period. It is based primarily on the papers of Russell, Palmerston, Gladstone, Cowley, Layard, Panizzi, and Lacaita, as well as foreign office records and the diaries of contemporaries.

Soon after his arrival in Turin Hudson began to distinguish himself by his strong sympathy for the Italian cause. He became a good friend of Cavour as well as many of the more revolutionary figures of the time, and used his influence both in Italy and in England to further Italian unity and independence. He was so successful in his work that he was credited by many in both countries with having rendered Cavour invaluable aid in achieving his objectives. He did this with only occasional help from, and often in spite of, his own government. In 1860 the London Times praised him for having disobeyed the instructions of two successive administrations, and having acted according to the wishes of the English people. There was enough truth in this backhanded compliment to expose Hudson to the criticism that his love for Italy had adversely affected his performance as an English diplomat.

The evidence indicates that Hudson did consistently support Sardinian policy, even when this was difficult to do. His unremitting and persuasive efforts on behalf of Italy certainly had some effect on British attitudes. This was particularly so during the conquest of the south, when Hudson helped to convert Lord John Russell to an acceptance of what had taken place, which resulted in the famous despatch of 27 October 1860 giving Britain's blessing to Sardinia's absorption of the kingdom of the Two Sicilies.

Hudson's devotion to the cause of Italy sometimes resulted in questionable behavior. On occasion he "softened" his instructions or turned a blind eye to Cavour's intrigues. His judgment was warped to some extent by an excessive suspicion of the Bonapartes. However, there seems to be no ground for the accusation that he neglected "British interests." He felt that he was merely following the instructions he had received throughout his career to support constitutional government whenever possible. In Italy this meant backing Cavour and the national party. Furthermore, unlike those who feared that Italy would succumb to French influence, Hudson maintained that only an Italy which was strong enough to be truly independent would be able to stand up to France and counterbalance her in the Mediterranean, a situation which would definitely be in Britain's interest. Subsequent events would seem to show that his expectations were correct.

Microfilm $3.40; Xerox $11.95. 262 pages.

THE QUEST FOR EMPIRE UNITY: THE IMPERIAL FEDERATIONISTS AND THEIR CAUSE, 1869-1893.

(Order No. 61-3554)

Robert Alexander McMillan Shields, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Holden Furber

The object of this study was to determine the reasons why the movement for a closer unity of the British Empire took its rise in the latter part of the Victorian era and why it failed. During this period a group within the United Kingdom displayed a mounting concern for the position of the mother country in a world of hostile and rearming powers and in which the country's previously unchallenged industrial and commercial supremacy was being threatened by efficient and competitive neighbours. To this group, known collectively as the imperial federationists, a much closer union with the self-governing colonies of the empire seemed to promise the best means of restoring an unfavourable balance.

In order to assess the strength of this movement particular attention was paid to expressions of concern for the unity of the empire in the periodical press and to a lesser degree in the daily press of the United Kingdom. The demand for imperial federation in its various phases was voiced most frequently in the counsels of such imperial-minded organizations as the Royal Colonial Institute and the Imperial Federation League and a detailed assessment of the proceedings of these societies was conducted.

The federation movement ultimately failed because of strong opposition from the administration of the mother country itself and from the administrations of the self-governing colonies. An analysis of this opposition was based upon the records of those departments of state most concerned with the imperial-colonial relationship. These

included the Colonial Office, the Foreign Office and to a lesser extent, the Board of Trade. The policy decisions of these departments, prepared by the permanent Under-Secretaries and Assistant Under-Secretaries, revealed an attitude hostile to any suggestion that the United Kingdom should compromise her freedom in diplomatic and commercial matters for the sake of an imperial union in which the self-governing communities of the empire would have a voice in determining such policies. By the same token, these records underlined a colonial antagonism to the campaign for federation of the empire. The despatches from colonial governors and the responsible statesmen of the several communities displayed a fear that closer ties with the mother country could mean a threat to colonial tariff protection and an obligation to assist in the defence of a far-flung empire in which the majority of self-governing colonies confessed to having slight interest.

The imperial federation movement reached its perigree in 1893 with the dissolution of the Federation League but the seeds of failure had been planted long before this date. Though the emergence of such world powers in this period as Germany and the United States and the resurgence of France following Sedan seemed to indicate a need for bolstering the United Kingdom's position, those who promoted federation of the empire as the solution were far too unaware of the obstacles to their goal. Throughout the late Victorian era a spirit of nationalism characterized the self-governing colonies and to communities seized with a determination to chart their own destinies the proposals of the federationists seemed retrograde and loomed as a distinct threat to their powers of self-government. Also, the proponents of a united empire overlooked the fact that the vast majority within the mother country was totally unprepared to sacrifice the United Kingdom's independence of action on the international scene or to modify her adherence to free trade as the cardinal principle of commercial policy at that time. In promoting imperial federation over a period of close to a quarter of a century without taking careful account of the strength of both British and colonial opposition the imperial federationists contributed signally to their own failure.

Microfilm $5.90; Xerox $20.95. 464 pages.

ATTITUDES AND REACTIONS OF SOUTHERN BAPTISTS TO CERTAIN PROBLEMS OF SOCIETY, 1865-1900.

(Order No. 61-3604)

Rufus Buin Spain, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Henry Lee Swint

The last thirty-five years of the nineteenth century constitute a significant transitional period in United States history. The modern industrial nation which had developed by 1900 contrasted sharply with the agrarian country of a generation earlier. Changes in the economy, in politics, in scientific knowledge, and in social institutions created problems for which there were no obvious answers. Individuals, philanthropic societies, churches, and government at all levels joined in the search for means of alleviating the disorders and tensions which change had produced.

No aspect of American life confronted greater problems than traditional religion. Challenged by a rational theology, scientific criticism of the Bible, the study of comparative religions, the new sciences, and the problems of industrialization, orthodox Protestantism fought hard to preserve its historic role in the life of the nation.

This thesis is a study of the Southern Baptist denomination in the eleven ex-Confederate states and Kentucky during this crucial period. The purpose of this study is to ascertain the attitudes and reactions of the denomination to some of the important social issues of the nation and particularly of the South. The congregational structure of Baptist church government rendered impossible the statement of official views. Consequently, the problem of determining "the" Baptist position was often difficult. What is presented in this thesis as "the" Baptist opinion on any given issue, therefore, is the opinion shared by a majority of Baptists. Significant dissenting opinions are also presented.

The principal sources for this study were the minutes and reports of the Southern Baptist Convention, minutes and reports of the twelve Baptist state conventions, and the denominationally-approved papers published weekly in each of the Southern states. The weekly papers were the most enlightening sources since they reflected very clearly the varied opinion among Baptists. Although none of these sources presented official positions of the denomination, a fairly coherent body of opinion emerged when the many shades of opinion from all the different sources were critically evaluated.

The problem areas treated in this study were political Reconstruction and national reunion after the sectional schism; the changing position of the Negroes in Southern society following emancipation; dislocations in the economy, both agrarian and industrial; standards of personal morality; and temperance, law-enforcement, women's rights, care of the wards of society, and other objects of social reform.

The most significant conclusion which can be drawn from this study is that historians have over-emphasized the other-worldliness of Southern Baptists (and other churches of the South) and have failed to give adequate attention to their interest in earthly affairs. While it is true that the South remained the stronghold of religious conservatism in comparison with other sections of the country, this study clearly shows that Southern Baptists were keenly aware of social conditions and that between 1865 and 1900 they became increasingly conscious of their responsibility to society. In 1865 Baptist activities encompassed little more than preaching the gospel, but by 1900 they included temperance reform, anti-gambling crusades, campaigns for the elimination of political corruption and the promotion of public morality, care of orphans and the aged, and other projects of social significance.

On the other hand this study also reveals what an inquiry into the social relations of any accepted religious institution must reveal--that is, that religion supports the basic institutions and views of the society in which it flourishes. Baptist attitudes toward politics, race relations, the economy, and other areas of Southern society harmonized with the prevailing views of Southerners in general. Only on matters which involved Biblical teachings or a narrow code of personal morality did Baptists run counter to Southern society, while the less evident forms of social evil went unchallenged.

Microfilm $5.10; Xerox $18.00. 398 pages.

W. CAMERON FORBES AND THE HOOVER COMMISSIONS TO HAITI.

(Order No. 61-3402)

Robert Melvyn Spector, Ph.D.
Boston University Graduate School, 1961

Major Professor: William B. Norton

Haiti won independence in 1804 and for 111 years thereafter endured political and social turmoil. The mulattoes were locked in struggles with the blacks, the Army interfered with the Civil Service, corruption in government was considered to be normal, financial stability was destroyed by the break-up of the great sugar plantations and the shift from a sugar-based economy to one of wild coffee, literary education was emphasized to the detriment of technical, and the country was beset by the problem of overpopulation.

In 1915, in an effort to protect American investments, prevent European (especially German) infiltration, and stabilize the nation, President Woodrow Wilson ordered our intervention in Haiti. But the character of the intervention changed by the close of the First World War; from an intervention it became an occupation by the United States for the purpose of tutoring Haiti in the methods and activities of Anglo-Saxon democratic government. Backed by the power of American marines, the United States set up active departments of public works, finance, commerce, public health, established the Service Technique (designed to promote technical education), and substituted an American officered constabulary for the inefficient Haitian army.

Despite its efforts and good intentions, the United States was accused of imperialistic policies. Haitians appeared to appreciate only one aspect of the Occupation, the Public Health Service. All others were interpreted as furtherances of American imperialistic policies. When by the end of 1929 Haiti experienced riots, strikes, and general opposition to continued American occupation, Hoover decided that our foreign policy toward Latin-American countries required serious review.

Hoover sent Forbes to Haiti (1) to end the violence, (2) to assess the fifteen years of American occupation, and (3) to recommend a foreign policy toward Haiti and Latin-America which would promote friendship instead of animosity between the United States and its neighbors to the south.

The Forbes Commission remained in Haiti approximately two and one-half weeks, during which time it held hearings at which all Haitians and officials of the American Occupation were invited to speak, took a brief trip through the interior of the country, and gathered information for its official report to President Hoover. The Commission ended the violence by acceding to demands for a return to government by a freely elected National Assembly and a new Chief executive of Haiti. It recommended that, despite the many good things done by the Occupation, the enmities aroused thereby demanded the withdrawal of American forces, that this withdrawal be gradually done, and that it be completed by 1936. Finally, it recommended that the United States surrender its policy of intervention in the internal affairs of Latin-American countries, that we stand by to assist when our assistance is requested, but that we no longer intervene by unilateral decision.

The Moton Commission, which was in reality merely an extension of the Forbes Commission, consisted of American Negro educators who went to Haiti in June, 1930, solely to assess the Haitian educational system as of that year. It confirmed Forbes' conclusion that the education of Haitians should be left to Haitian control.

The Forbes Commission had certain defects: (1) it remained for too short a time in Haiti, (2) its personnel was not sufficiently diversified in background, (3) its personnel was too advanced in age for the arduous tasks involved, (4) it placed too much reliance upon secondary rather than first-hand sources of information, (5) it did not travel as extensively throughout the country as it might have done, (6) its investigation received too much publicity, and (7) it was subject to too many world influences such as the London Disarmament Conference of 1930.

Nevertheless, acting upon the conclusion of the Forbes Commission, Hoover started the withdrawal from Haiti which marked the beginning of the "Good Neighbor Policy" of the Roosevelt administration.

Microfilm $4.60; Xerox $16.20. 359 pages.

THE CENTRAL AMERICAN CAREER OF E. GEORGE SQUIER.

(Order No. 61-3781)

Charles Lee Stansifer, Ph.D.
Tulane University, 1959

Chairman: William J. Griffith

Beginning with his appointment as United States chargé d'affaires in Central America in 1849, E. George Squier was vitally concerned with Central American affairs. His diplomatic service lasted only a little over a year, but in 1852 he began to promote the Honduras Interoceanic Railroad Company, a task which occupied much of his attention until 1859. Meanwhile, in the 1850's, he turned out books and numerous articles justifying his part in Anglo-American isthmian rivalry, promoting the railway project, and publicizing Central America. Until 1872, when he was declared insane, he continued to devote much of his time to Central America, collecting source materials and publishing the results of his research on Central American archaeology and ethnology.

Although historians have long recognized the importance of Squier's Central American career, there has been no systematic analysis or interpretation of his work. The present study undertakes to supply the details of Squier's activities concerning Central America and to evaluate the effects of his career on Anglo-American isthmian rivalry and on Central America. The four phases of his Central American career are examined in detail. The diplomatic phase, covering the years 1849-1850, is presented in Chapters II and III; the promotional, 1852-1859, in Chapter IV; the publicist, 1852-1870, in Chapter V; and the scholarly, 1848-1872, in Chapter VI. Chapter I presents a brief summary of Squier's early journalistic and scholarly interests and Chapter VII presents the conclusions.

The study is based primarily on manuscript materials. Important collections of Squier's correspondence were found in four locations: the Huntington Library in San Marino, California, the New York Historical Society in New York City, the Library of Congress in Washington, D.C.,

and the Middle American Research Institute at Tulane University in New Orleans. The extensive Central American holdings of the Middle American Research Institute provided the most important secondary materials for the study.

Central America, when Squier's career there began, was scarcely known to the United States. United States diplomacy up to that time had been largely ineffective and British interests in Central America were supreme. In the decade of the 1850's the United States, spurred on by the realization that quick transportation to the newly acquired Pacific coast territories necessitated a greater interest in the isthmus, established her influence in Nicaragua, Honduras, and El Salvador and successfully urged Great Britain to begin a gradual withdrawal from her territorial interests in Central America. Squier was the instrument for the introduction of United States influence. His forceful diplomacy made it clear to the British that the United States was not to be denied an important place on the isthmus and his numerous, anti-British writings helped to convince Great Britain to withdraw from the Bay Islands, claimed by Honduras, and from her protectorate over the Mosquito Indians on the Nicaragua and Honduras coasts.

Probably Squier's writings were his greatest contribution to Central America. In his ten books and nearly fifty articles he compiled a remarkable amount of information on Central American climate, topography, natural resources, and population, and for the most part it was reliable. His more serious writings called attention to the archaeological importance of Honduras, Nicaragua, and El Salvador and supplied interested scholars with a great deal of information concerning archaeology, ethnology, and linguistics. Altogether his works place him far above all rivals as the foremost authority on Central America in the mid-nineteenth century.

Microfilm $2.95; Xerox $10.35. 227 pages.

THE HISTORY OF THE UNA SANCTA MOVEMENT IN GERMANY

(Order No. 61-3173)

Leonard Joseph Swidler, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor George Mosse

The Una Sancta Movement, a Catholic-Protestant ecumenical movement centered in Germany since the end of the first World War, takes its name from the Nicene Creed, "Credo ... unam sanctam ... ecclesiam." The movement has peculiar significance because it is the only ecumenical movement in which the Catholic Church has participated, at least until the past two or three years.

A number of events and movements within the past half century have been factors in the growth and formation of the Una Sancta. The movement after the first World War away from liberal theology in the Protestant Church toward a more dogmatic theology, such as that of Karl Barth, made possible a conversation between some groups within Protestantism and Catholicism. The shift toward a more objective treatment of the Reformation, especially by Catholic scholars, reduced some of the old tensions. The growth of the liturgical movements in both churches, with the interest in the vernacular in the Catholic church and the growth of ritual in the Protestant, drew the churches together. In the Catholic Church a Bible Movement has created a new common meeting ground for the confessions. The growth of the world-wide Ecumenical Movement has to some extent provided inspiration and leadership for the Una Sancta Movement. Within the Catholic church there has been a great increase in the importance of the laity, a concept central to Lutheranism. Added to these was the persecution of the two churches by Naziism and the post-war influx of refugees into areas which had previously been only Catholic or only Protestant.

Already in the 1920's groups of High-Church-minded Protestants had begun to organize and publish their own magazines. Catholics sometimes were members of these organizations and contributed to the periodicals. By the middle 1930's a number of cities and towns began forming small inter-confessional groups for discussions.

Dr. Max Josef Metzger, a Catholic priest, actually organized these groups together and in 1938 founded the Una Sancta Brotherhood which, together with an order of sisters he founded, distributed printed materials and sponsored several large Una Sancta conferences. Although Father Metzger was arrested several times by the Nazis, and finally beheaded for his efforts to bring about peace, the order has continued to publish material important for the Una Sancta work, including the quarterly Una Sancta.

In the years after the war the movement became widely popular. Scores of Una Sancta circles of Protestants and Catholics, lay and cleric, were formed throughout the four zones of Germany to discuss religious problems. Huge rallies with speakers from both confessions were sponsored by many of the circles.

In 1948 the Holy Office in Rome issued a Monitum reminding Catholics that Canon Law forbade public inter-confessional meetings and any inter-confessional religious services; Una Sancta activity slowed down considerably until in the following year Rome issued an Instructio somewhat less rigid in tone and gave the responsibility for ecumenical activities to the German bishops, or their delegate. Shortly afterwards the proclamation of the bodily Assumption of the Virgin Mary as dogma again cooled inter-confessional relations in some areas.

Since then the work has continued on a more scholarly theological level although popular interest has by no means disappeared. A large number of significant works have been published in recent years, and officially appointed theologians meet in regular conference. The announcement of the new Ecumenical Council has aroused new interest in Catholic-Protestant ecumenical activities.

Microfilm $5.45; Xerox $19.35. 428 pages.

THE FRANCONIAN REICHSKREIS AND THE HOLY ROMAN EMPIRE IN THE WAR OF THE SPANISH SUCCESSION

(Order No. 61-3476)

Roger Andrew Wines, Ph.D.
Columbia University, 1961

This study attempts to clarify the role of the Imperial Circles or Reichskreise in the constitution of the Holy Roman Empire in the period after the Treaty of Westphalia (1648). It concentrates on one of the best organized Kreise, Franconia, and it focuses chiefly on the years 1697-1714 when the European crisis over the Spanish succession stirred in the small German states a sense of Imperial loyalty which found expression in renewed Kreis activity and the formation in 1697 of a permanent Association of the Kreise for Imperial defense. Leaders in this movement were Lothar Franz von Schoenborn, Elector of Mainz, Bishop of Bamberg; Johann Georg von Kulpis, a Wuerttemberg councillor; Ludwig Wilhelm of Baden, Imperial General on the Rhine.

For sources this work draws on contemporary printed collections, monographs, and the archives of the three states, Bamberg, Bayreuth, and Ansbach, which served as Corresponding Princes of the Franconian Kreise.

It discusses the nature of the Kreise, which were at once provincial subdivisions of the Empire, local alliance unions of princes, semi-sovereign corporations exercising a wide range of economic, judicial, military and diplomatic powers. Franconia raised a strong standing army, financed it with extensive loans, levied taxes on the Kreis members, negotiated with France, Austria, England, Holland, and other Imperial Kreise. Its Kreis administration was handled by the two Corresponding Princes, Bamberg and Bayreuth; military affairs by the Kreis Commander Margrave Christian Ernst of Bayreuth, legislative activity by the Assembly of the 28 Kreis members which met in Nuernberg.

Following an independent foreign policy, Franconia with the Kreis Association joined the Grand Alliance and began war against France in 1702 before the Imperial Diet acted. Under Schoenborn and Christian Ernst it successfully invaded the Bavarian Upper Palatinate while supplying regiments for the Rhine defense against France. Its troop strength, which reached 11,000, formed a major part of the Imperial Army. Alienated by Austria's neglect of the Empire's defense after 1706, Franconia and the Association looked toward alliance with Holland and a territorial barrier against France for their future security. But when the Dutch joined England in peace with France at Utrecht in 1713, they were thrown back into dependency on Austria, and the disastrous campaign of 1713 led to the unfavorable peace treaties of Rastatt and Baden (1714) which wrecked all their hopes.

The Kreis constitutions in Franconia and Swabia, to a lesser extent in Bavaria, Electoral Rhine, Upper Rhine and Westphalia were active organizations in the early eighteenth century. As the central powers of the Empire steadily weakened, they had taken over on a local level the Imperial functions of regulating coinage, public peace and order and defense. During the War of the Spanish Succession, while the Diet of the Empire was largely paralyzed by disputes and ineffective, the western Kreise through their Association were the effective force of the Empire. If they were unable to wring concessions from France by a victorious offensive, their defense spared the Empire further disastrous depredations. Schoenborn's, Kulpis' and Baden's plans to revitalize the whole military constitution of the Empire, basing it on revived activity by all ten Kreise, were defeated by opposition from Austria and the great princes. But the five Associated Kreise (Swabia, Franconia, Upper Rhine, Electoral Rhine, Austria) formed after 1714 a permanent alliance which maintained a standing army in the several states, garrisoned the border forts against French attack, and preserved in their territories a center of loyalty to the Empire in the last century of its existence.

Microfilm $5.20; Xerox $18.45. 406 pages.

THE COMING OF THE ARABIC-SPEAKING PEOPLE TO THE UNITED STATES

(Order No. 61-3394)

Adele Linda Younis, Ph.D.
Boston University Graduate School, 1961

Major Professor: Frank Nowak

Eminent historians and writers have frequently referred to the important role American missionaries played in acquainting Arabic-speaking people of the Near East with the United States, which subsequently led to their emigration to America. Studies of available letters, reports, and biographies reveal the founding of educational, clinical, and press publications in Syria during the early nineteenth century. These occurred simultaneously with important changes that began to take place within the Near Eastern area. Forerunners, like Pliny Fisk and Levi Parsons in 1819, were followed by prominent American men and women who worked among the people in peace and in times of civil disturbances. The presence of these strangers from a distant country, who made available their services in humane endeavors without political opportunism, enhanced greatly American prestige in the Near East.

The few emigrants in the United States between 1849 and 1860 came through this association with Americans. Monseigneur Flavianus Kfoury, Superior General of St. John's Convent in Khonchara, Lebanon, sought American Catholic aid to restore the monastery destroyed by civil wars. Antonio Bishallany, also of Mount Lebanon, studied here, hoping to acquire a wider background in Protestant missionary education. One exception to the missionary story during this period is that of Hadji Ali or Hi Jolly. He led a Levantine group to the United States in 1856 when this country introduced the camel caravan into the Arizona territory.

There is evidence that there were earlier arrivals of Moors from North Africa who came with the Spaniards. Father Elias al-Mawsili, of Mosul, Iraq, reached Mexico and South America in 1668. Some Rabbis from Asia Minor were in Newport, Rhode Island, in the middle eighteenth century. Algerians may have brought horses here for the Continental army during the American Revolution. By 1856 statistics reveal about 272 Near Easterners in the United States, including North Africans. But these classifications are not certain. However, widespread emigration to the

United States occurred only after the American Civil War.

The later nineteenth century proved fruitful for American missionary workers in Syria, who expanded their activities. Need for higher education led to establishing the Beirut Seminary for Women and the Syrian Protestant College, later the American University at Beirut. But increased emigration induced by education--American, European, and native--and economic opportunities abroad threatened the Syrian economy and American expansion programs.

Contemporary writings in English and Arabic reveal the emigration story. Those who learned English before leaving had one advantage over other immigrants. The Centennial Exposition of 1876, the Columbian in 1893, and the St. Louis Fair of 1904 further spurred emigration. These American observances attracted entertainers, artisans, and entrepreneurs from the Near East.

Emigration came to a peak between 1900 and 1915. Approximately 85.000 arrived in those years. Previously some 25,000 had entered the United States. Many were traders. Some started out as peddlers before establishing commercial enterprises, with New York City the principal trade center in the reawakened Phoenician spirit. Others found work in industry, with large concentration in textile areas.

The right of Syrians to naturalization was tested in Federal courts and resolved in their favor. World War One and the immigration quota system of the 1920's almost halted Arabic migration here.

The mood of the period between the two wars produced anti-immigrant attitudes. But this period also witnessed the growth of settlements, expansion of enterprises, cultural and religious establishments among Christians, Moslems, and Hebraic Syrians in large centers. Sympathetic understanding became evident as ideas flowed between them and the general public. These forerunners became, generally speaking, the fathers of the present Arabic-speaking Americans in the United States.

Microfilm $4.85; Xerox $17.10. 377 pages.

JOURNALISM

A HISTORY OF THE AMERICAN MOTION PICTURE NEWSREEL

(Order No. 61-3797)

Raymond Edwin Fielding, Ph.D.
University of Southern California, 1961

Chairman: Professor MacCann

The problem of this study was to trace the history of the American motion picture newsreel from the time of its origins until 1960.

It was found that the form and traditions of the newsreel derived from those of the news-film and the actuality-film, both of which had appeared throughout the world before the turn of the century contemporaneously with the appearance of photographic illustration in newspapers and magazines.

In the United States the first news-films of any financial consequence to be exhibited were prize-fight films which appeared as early as 1894. By 1900, however, every category of content which was to characterize the newsreel for the next half century had already appeared. The faking of content was commonly practiced; nevertheless, popular belief in the veracity of the news-film was widely held. Such early news films appeared in great numbers and played a significant role in the popularization and technical sophistication of the motion picture.

After 1900 the popularity of the news-film declined until by 1908 the American film had become a predominantly theatrical, story-telling medium. In 1911, despite an apparent lack of market or demand, a new type of news-film series, the regularly released newsreel, was introduced in the United States. The first of these to be produced and released exclusively for the American market was presented by the French firm of Pathé Freres in August of 1911. During the next half century at least twenty-two other organizations also introduced newsreels in the United States, but only five achieved any distinction and lasted for more than a few years: Pathé, Paramount, Universal, Hearst, and Fox.

The American newsreel may be said to have flourished for only two brief periods in its history. The first of these extended from about 1920 to 1927 when editorial innovators worked to maximize interstudio and intercameraman competition, exploited new types of subject matter, built newsreel stories in a journalistic fashion, and spent lavish sums of money to support internationally scattered staffs of cameramen.

A second and even briefer period of innovation lasted from about 1927 to 1932 when a new and now almost forgotten type of newsreel coverage appeared which featured unmanipulated sound-film interviews with internationally famous political personalities. Within the next few years, however, a variety of technological refinements were introduced which led to the reduction of natural, on-the-spot sound and its replacement with studio-manufactured sounds. The immediacy, realism, and authenticity of the medium declined, while the potential for fraudulent content manipulation increased. Artistic and journalistic criticism of the newsreel's style and of its alleged propaganda content became common, and the veracity of the sound newsreel was widely and frequently questioned.

With the outbreak of World War II the responsibility for newsreel production passed largely from the civilian industry to agencies of the United States government. Following the war, a decline in newsreel quality became apparent, the causes of which could be traced back to earlier years.

A number of factors appeared to have combined to

render the newsreel less effective as a medium of public information than it might otherwise have been—the decline of interstudio and intercameraman competition, the failure of the industry to provide adequate financial support, the reluctance of producers to explore controversial subjects, the frequent practice of content-faking, the censorship of newsreels by exhibitors, the economic insulation of the newsreel from box-office competition, and the failure of newspaper-oriented producers to impress a more cinematic or dramatic structure upon their materials.

Microfilm $5.70; Xerox $20.30. 447 pages.

DIFFERENTIAL JUDGMENTS OF SCIENCE NEWS STORIES AND THEIR STRUCTURAL CORRELATES

(Order No. 61-3120)

Kenneth Gardner Johnson, Ph.D.
The University of Wisconsin, 1961

Supervisor: Associate Professor Percy H. Tannenbaum

Purpose. The primary purpose of phase one of this study was to compare the dimensions of judgment used by scientists, science writers, editors, and readers in judging science news stories. The specific judgments of each of these groups were also compared.

The second phase concerned the structural and content correlates of the dimensions of judgment.

Procedure. Thirty scientists, 17 science writers, 23 newspaper editors, and 43 newspaper readers read 40 science news stories and rated each one on a series of 25 semantic differential scales. (By means of a filter question the "reader" group was divided into 23 readers of science news and 20 non-readers of science news.)

Scale-by-scale intercorrelations were obtained for each group, then subjected to factor analysis to obtain the dimensions of judgment for each group. The factor structures were compared (1) by means of a least squares approximation, (2) in terms of the scales with high and restricted loadings, and (3) in terms of variance accounted for by each factor.

The distances between the specific judgments of the groups were computed by means of the D statistic, and mean factor scores on each dimension were compared.

Twenty-two stylistic and three content variables within the stories were correlated with mean semantic differential scores for each group in order to explore the objective correlates of subjective reactions to science news stories.

Results. Three major dimensions accounted for approximately 80 percent of the common variance for all of the groups. The groups used essentially the same dimensions of judgment with the exception of the editor group. The dimensions for the editor group, in order of the variance accounted for, were labeled (1) newsworthiness, (2) difficulty, and (3) accuracy. For the other four groups the dimensions were labeled (1) evaluation-accuracy, (2) difficulty, and (3) excitement or sensationalism. The dominant dimension in the judgments of the editor group--newsworthiness--corresponds most closely to the excitement or sensationalism dimension for the other four groups.

In terms of the distance between the specific judgments of the groups (computed by means of the D statistic), the science writer was found to be closer to the scientist, editor, and reader groups than these groups are to each other. Generally speaking, the specific judgments of the groups were quite similar.

None of the stylistic factors were found to be significantly related to the evaluations of the stories or judged accuracy. Judged difficulty correlated quite well with measures of readability and to some degree with the stylistic factor "human interest," which included such variables as pronouns per words, personal pronouns per words, and percentage of active predicates. Judged excitement showed a much higher correlation with measured readability for editors and science writers than for readers and non-readers. It showed no correlation with readability for the scientists.

The common assumption of many editors and some science writers that readers are not interested in science per se, but are interested only in results and implications, was not supported in this study. On the contrary, stories with a higher percentage of research were evaluated more favorably and considered more accurate and exciting by scientists, readers, and non-readers than those with relatively high percentages of results or implications.

Conclusions. In contrast with the other four groups in the science communication chain, whose evaluations of science news were related to such aspects as importance, accuracy, and significance, the editors evaluated science news stories largely on the basis of color and excitement. Indeed, the findings suggest that the editors put far more emphasis on color and excitement than their readers would demand. In terms of both dimensions of judgment and specific judgments the science writers appear to be better mediators than the editors.

Microfilm $3.10; Xerox $10.80. 239 pages.

LANGUAGE AND LITERATURE, GENERAL

A TEXTUAL STUDY OF THOMAS TYRWHITT'S EDITION OF THE CANTERBURY TALES (1775-1778)

(Order No. 61-3420)

Sister Mary Florence Burns, C.S.J., Ph.D.
Columbia University, 1961

Because of Thomas Tyrwhitt's own statement that the text of his edition of the Canterbury Tales was formed on the basis of twenty-five manuscripts and the two editions of Caxton, scholars have heretofore dismissed it as an example of the eclectic method of eighteenth century editors. Fortunately, Tyrwhitt's original collations and preliminary corrections of the text have been preserved in the Harvard University Library. This Collation Text, together with the Printer's Copy of Tyrwhitt's edition, discovered by the University of Virginia, provided the source materials necessary for this analysis of Tyrwhitt's textual method and a re-evaluation of this eighteenth century scholar's contribution to the restoration of the text of the Canterbury Tales.

Study of the Collation Text reveals that Tyrwhitt's original collations were made on blank sheets inserted in Speght's printed edition of 1687, and that the printed text was altered in accordance with the manuscript readings. Moreover, close inspection of the collations makes clear that he never consistently consulted all of the manuscripts cited in his preface. Occasional collations from the Oxford manuscripts and scattered references to them in the Notes to the first edition indicate that he was familiar with them, but apparently he had early rejected them from serious consideration. Of the remaining manuscripts he used only nine systematically. Tyrwhitt's lists of the manuscripts which he used for specific pages and lines in the Collation Text have been checked against Manly and Rickert's The Text of the Canterbury Tales, Studied on the Basis of All Known Manuscripts. The analysis makes clear that Tyrwhitt based his text principally on Ms. A (Harleian 7335). Where passages were missing because of loss of leaves, he relied on Ms. C.1 (Cambridge Dd.iv. 24). Only where both of these manuscripts were defective did he turn to other manuscripts. An analysis of his departures from the manuscript which he listed as his primary guide for any given section of the text has demonstrated Tyrwhitt's critical acumen in recognizing faulty readings even in the manuscripts on which he relied most heavily. Accordingly, although his text is, strictly speaking, eclectic, his method was not intentionally so. Had Ms. A contained the complete text of the Canterbury Tales, he would undoubtedly have followed it, except for occasional passages of exceptional difficulty. His choice of Mss. A and C.1 as the best of those available to him has been validated by modern scholarship.

The combined evidence of the Collation Text and the Printer's Copy, together with the "Introductory Discourse to the Canterbury Tales" in his first edition, has established the manuscript basis and scholarly reasoning for his changes in the order of the tales, and his introduction of the order now given in the editions of Manly and Rickert and Robinson.

Finally, an intensive study of approximately one hundred fifty passages in which Tyrwhitt made extensive corrections, insertions, or omissions in Speght's text has established his fidelity to the manuscripts and the extent of his contribution to the restoration of the text of the Canterbury Tales.

The detailed analysis of Tyrwhitt's textual method presented in this dissertation demonstrates that Tyrwhitt actually anticipated the editorial method of such modern scholars as F.N.Robinson, who has based his standard edition of the Canterbury Tales on the Ellesmere Manuscript, but in a number of passages has substituted readings from other manuscripts. The lines quoted throughout the dissertation serve as examples of the closeness of Tyrwhitt's text to Robinson's. The final conclusion to be drawn from this study, then, is that Tyrwhitt's edition of 1775 constituted the first modern critical edition of The Canterbury Tales.

Microfilm $3.60; Xerox $12.60. 277 pages.

SHAKESPEAREAN LAUGHTER: A STUDY OF SHAKESPEARE'S BASES OF LAUGHTER AND THEIR IMPLICATIONS.

(Order No. 61-3365)

Ralph William Edwards, Ph.D.
Boston University Graduate School, 1961

Major Professor: Doris Holmes

In attempting to discover the significance of laughter in interpreting Shakespeare's plays, one must realize that laughter is not always certain in any given instance, that no single, simple explanation of laughter either of the past or of the present will cover all kinds of laughter, and that people in different countries and periods laugh at different things differently. It is possible, nevertheless, to discover with considerable certainty what people laughed at in Elizabethan times. Although the small amount of sixteenth century theory about laughter probably had little direct influence upon the Elizabethan dramatists, a study of contemporary comments on the theater, of some plays by Shakespeare's contemporaries, of Elizabethan jigs, and of the jest-books of successful Elizabethan comedians indicates that certain actions, speeches, topics, and types of characters and situations were likely to evoke laughter. I drew up a list of these topics and devices for securing laughter and selected those often repeated in the various sources. The similarity of topics and devices appearing

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

in both dramatic and non-dramatic sources makes it reasonable to believe that certain things had become established as evocative of laughter in Elizabethan times.

A study of selected early religious plays, of moralities, and of school, court, and professional plays shows that certain topics on the already developed lists keep reappearing and become traditional sources of laughter and that laughter varies with the kind of audience for which a play was designed. It also shows that the repetition of certain topics for securing laughter in the same play and the constant direction of the laughter of the audience at a certain person and with others emphasized the theme of the play as, for example, in Wyt and Science with its praise of the academic virtues and the condemnation of idleness and ignorance.

On the basis of these facts, a study of some Shakespearean plays of which interpretations are fairly well established, shows that Shakespeare, consciously or unconsciously, varied the sources of laughter with the kind of play and with the kind of audience for which it was intended, for example, in a farce like The Comedy of Errors, in a court play like Love's Labor's Lost, in a fantasy like A Midsummer Night's Dream, in a joyous popular comedy like As You Like It, and in a tradegy like Othello.

I then used the study of laughter to help clarify some of the controversial plays. A study of the direction of laughter and the devices and topics for securing laughter indicates that Polonius, although he used clown devices, was more than a clown; that Falstaff changes constantly and in one direction from the great comic hero of Henry IV, Part 1, to a defeated, absurd creature in The Merry Wives of Windsor; that the Elizabethan viewed Shylock as a laughable character; that Troilus and Cressida is an attack on appetite that destroys order; that All's Well That Ends Well has no consistency in its use of laughter; and that Measure for Measure, through its comedy, shows the futility of trying to control a natural urge by law.

It follows, therefore, that the study of laughter can be used as a means of interpreting not only a Shakespearean play dominated by laughter but also a play in which laughter is only a contributing factor, provided laughter is assumed only in those places where there is reasonable certainty that the original audience did laugh.

Microfilm $5.05; Xerox $17.80. 393 pages.

A STUDY OF LITERARY IDEALS AND INTENTIONS IN PHILADELPHIA, 1783-1827.

(Order No. 61-3505)

Herbert Garfield Eldridge, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Robert E. Spiller

This study has three major objectives: first, to identify the values and ideals which inspired and controlled literary contributions of Philadelphians between 1783 and 1827; second, to survey the publications of Philadelphians in three fields--law, medicine, and creative literature--in relation to these values and ideals; and third, to evaluate the literary accomplishments of Philadelphians and offer some explanation for the city's strength in scientific and utilitarian writing and its weakness in imaginative writing.

The discussion is divided into four chapters. Chapter I briefly reviews the colonial experience of the city with emphasis on traditional sectarian intellectual patterns, the formative urban institutions which appeared before the Revolution as the result of these patterns, and the growing body of nationalistic ideas which marked the Revolutionary era. Colonial literary ideals and attitudes are then identified in the light of the intellectual interests of the city. Chapter II attempts to identify post-Revolutionary legal ideals and surveys legal writing in relation to these ideals. Chapter III takes up medical ideals and institutions and reviews Philadelphia's contribution to medical literature as well as to the literature of the related sciences of chemistry, physiology and botany. Chapter IV notes the problems of the belletristic writer, reviews his artistic ideals, and surveys his achievements and failures with especial concern for the deficiencies of Philadelphia imaginative writing after the War of 1812.

The four chapters develop in common certain general attitudes and trends in Philadelphia letters. In the colonial experience of the city cultural energies flowed along well-defined lines, stimulated by overwhelming insistence on social service and directed by the strong predilection of sectarians for humanitarian, utilitarian, and scientific objectives. As the political and economic dispute with England grew in intensity, Philadelphians, along with other Americans, began to understand social service to mean contribution to the New World experiment in freedom.

In the period following the Revolution the city directed its cultural efforts to the needs of the republic. The lawyer, representing the traditional Anglo-American concern with lawful and constitutional government, set out to create a jurisprudence that would reflect the people's will as well as encourage responsibility and restraint. A significant element in realizing these objectives was a legal literature which would translate foreign legal experience into American terms and which would help circulate the judicial precedents so vital to the common-law system. The physician, representing the humanitarian and scientific interests of the city, applied himself to the tremendous problems of accident, disease, and death. In hours stolen from the demands of the moment, he edited and revised foreign medical and scientific learning and sketched out an American theory and practice. Literary work in these fields was undertaken confidently and energetically, with the wholehearted support and approval of the community.

On the other hand, the status of the creative artist in the city was ambiguous. He dealt in questionable social merchandise--in fantasy and immorality; he too often turned away from the group and its responsibilities, seeking seclusion and avoiding action; he spent his talents in amusing himself and others when there was all too little time for the mighty tasks at hand. Thus, lacking social approval, the belles-lettres suffered from attenuated development, and the triumphs of the romantic period found Philadelphia industrious elsewhere--and not particularly impressed. In short, the "decline" of Philadelphia creative literature occurred not because of the Federalism or neoclassicism of its writers and critics but because of the city's traditional concern with the useful and the scientific. And if imaginative writing was neglected or ignored, there was an abundance of literary activity in fields Philadelphians considered worthwhile.

Microfilm $4.50; Xerox $15.75. 349 pages.

DREAM AND REVERIE IN THE WRITINGS OF NATHANIEL HAWTHORNE

(Order No. 61-3667)

Rita Kaplan Gollin, Ph.D.
University of Minnesota, 1961

In Hawthorne's fiction, dream and reverie are both subject and method for reaching beneath the surface of human consciousness. Hawthorne emphasized that these states of mind were marvelous, yet entirely normal. Without claiming that they present the whole truth, he stressed their special truth in a society which ignored it. This concern gave shape and direction to his life and his literature.

Dreams appear in all of the literature that shaped Hawthorne's imagination, from the Bible through Poe. Yet none of this earlier literature embodies Hawthorne's concern with dreaming as an approach to repressed self-knowledge. Though he adhered to no system of psychology, and deplored the psychological pseudosciences, he drew on Puritan faculty psychology, Transcendental beliefs, and above all on Scottish philosophy while formulating his own approach to dreams.

Hawthorne proposed the legend of himself as a lonely dreamer, and later critics appropriated it. His life does seem patterned by alternating periods of isolated "dreaming" and social participation. Yet, as his notebooks and letters attest, he was most concerned with the connection between dreaming and waking experience. Even more important to him was reverie, in which real objects blend with imaginary; this was for him the condition of literary creation; and it underlies his theory of romance. His personal need to balance the claims of imagination and reality is projected into the dilemma of the artist-dreamers who people his fiction.

Hawthorne's short stories dramatize his conviction that dreams provide knowledge of the meaning and value of life even though total immersion in them is suicidal. Such knowledge also emerges from the varieties of half-light that stimulate the imagination and symbolize it, and from transitions between sleep and waking. In dreams we recognize haunting truths repressed by the conscious mind -- particular problems with profound moral overtones. In his early weird stories he transcends reality without surrendering it by suggesting that the apparently supernatural is really a dream.

Dreams also support the major concerns of each romance. But though Hawthorne used them with increasing flexibility, his emphasis on their limitations also increased. In The Scarlet Letter, reverie is integral to the central problem -- the causes and effects of sin. During reverie, Hester comes to terms with her sin and Dimmesdale suffers in a dream-like disjunction from reality. In The House of the Seven Gables, the unpleasant past invades the present through the protagonists' minds, notably Clifford's. And such major symbols as the house resemble dream symbols. The Blithedale Romance affirms that dreams contain important moral truths but emphasizes that dreams unfit the dreamer for ordinary existence. The novel's controlling metaphor is that Blithedale itself is a daydream separated from real life; penalties are exacted for such separation. Because Italy perplexed Hawthorne as a dream might, The Marble Faun has some of the obscurity, and power, of a dream; the protagonists move from one dream-like place to another, in a "sort of dream." Hawthorne's fear that dreams reflect sickness or immaturity recurs in Dr. Grimshawe's Secret. Yet the consciousness of Ned Etherege as he drifts through dream and reverie is the source of the novel's slender strength.

Unlike his contemporaries, but like ours, Hawthorne used dreams to dramatize normal subjective experience, to probe the subconscious and ultimately to discover the source of meaning in life.

Microfilm $3.40; Xerox $11.95. 262 pages.

THE MOLDS OF FORM: COMEDY AND CONSCIENCE IN THE NOVELS OF HENRY JAMES, 1895-1901.

(Order No. 61-3515)

Womble Quay Grigg, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Robert E. Spiller

The focus of this study of Henry James is upon his intellectual and esthetic development between 1895 and 1901. The former date, 1895, marks both the end of his dominating interest in the theater and the beginning of a new phase in the content and form of his novels. The latter date, 1901, marks the transition date to "the major phase." The problem of this study is to trace the development from relatively uncontroversial accomplishments in the novel before 1895 to original and controversial brilliance after 1901.

The procedure has been to establish the forces dominating his creative life in 1895 and to show in a series of critical chapters on individual novels how these forces led to the creation of his greatest novels between 1901 and 1904. I trace four primary strains in this development: the effect of his attempts to write short works, the progress of his experiments with the technique of point of view, the moral drama inherent in the situations he chose to treat, and the comic vision that is peculiar in nature and purity to the novels of this short period of years.

The result of the study is to establish that the era 1895-1901 was indeed a distinct phase in itself but a phase dominated less by an interest in narrative technique than by a matured moral and comic sense that asserted itself to produce The Spoils of Poynton, What Maisie Knew, The Awkward Age, and The Sacred Fount even though James wanted to make short stories of them and swore never again to write a long novel. This unplanned length and the accompanying complications of technique are the outward characteristics of the 1895-1901 phase, but length and technique are actually only the results of deeper forces within the newly-matured artist himself. The novels of the 1890's are all intended short stories that developed into novels as forces unrecognized in himself pushed the artist toward achieving successful fictional embodiment of a particular comic irony, the ambiguous relationship between good and evil, a theme that demanded technical experiment because of the unique nature and depth of his moral perception. Increasingly perceptive insights into the irony of human life combined with their concomitant, a growing sense of the absurd, to elongate and complicate each of the novels between 1895 and 1901. The greater difficulty of

the novels proceeded not from pointless experiment with technique but from maturation of the moral and comic sense.

Because the novels of "the major phase" were conceived at the same time as these other novels, and because the two phases are in other ways intimately related, the period 1895-1904 has a greater unity than usually thought. The fact that the novels of "the major phase" were conceived when James swore never again to write long novels doubtless influenced the form of the last novels, their small actions, their simple and emblematic situations, their ironic and symbolic nature. The situations used for all of the novels after 1895 appealed to him because a dramatic irony was inherent in each. They were to be swollen to "monstrous" size by the comic embroidery earlier developed in writing stage comedies and then refined in the novels of the late 1890's, and by the technical embroidery developed in the 1890's as a means of expressing the deepening vision for which the traditional, sequential English novel was inadequate.

Microfilm $3.80; Xerox $13.30. 295 pages.

EARLY DESCRIPTIONS BY FRENCH MISSIONARIES OF ALGONQUIAN AND IROQUOIAN LANGUAGES: A STUDY OF SEVENTEENTH- AND EIGHTEENTH-CENTURY PRACTICE IN LINGUISTICS.

(Order No. 61-4443)

Victor Egon Hanzeli, Ph.D.
Indiana University, 1961

Existing histories of linguistic science strongly criticize all language studies before the 19th century, claiming, among other things, that pre-19th-century grammarians were insensitive to the phonetic reality of speech, used notional rather than formal criteria in their analysis and, unaware of the structural uniqueness of the various languages, attempted to reduce the grammar of every language to Latin grammar. However, these adverse judgements have been based mostly on a historical study of classical scholarship, "general grammar" and linguistic theories, excluding "practical" work in non-European languages. They rest therefore on incomplete evidence and may be open to bias. To contribute further evidence, the present study examines a largely uncharted area: early French missionary linguistica, mainly in the Central Algonquian languages.

A historical sketch reviews the early French missions in Canada with particular emphasis on the activities of those missionaries who were the most outstanding scholars and whose linguistic works have come down to us in manuscript or, occasionally, in printed form.

The grammatical training of the missionaries is examined in a special chapter devoted to curricula and textbooks, where it emerges that 17th-century school grammars err on the side of indiscriminate use of several criteria rather than on that of consistent use of notional criteria in analysis.

The examination of the missionaries' learning and description of American Indian languages indicates that their approach was an eminently utilitarian one and completely free from scholarly ambition. Their "field-methods" in collecting linguistic information were surprisingly similar to those of our anthropologists.

In preparation for the core of the study, the primary sources, viz., extant manuscript grammars and dictionaries of Central Algonquian dialects are described, dated, and their dialectal affiliation ascertained.

The content of the linguistic works within this area is analyzed in the light of the grammatical training of the missionaries and is compared with modern descriptions of the dialects involved. It appears that in phonology the missionaries' records suffered on account of their authors' poor background in the study of speech sounds. However, the initial difficulties were partially overcome, new symbols and novel combinations of letters were introduced and the accuracy of the transcriptions increased with each successive generation of missionaries.

Their records are phonetically, and to some extent, phonemically more reliable than they have been assumed to be.

In morphology, the tension between the missionaries' static concept of classical grammar and their desire to penetrate the "economy" of the languages they were studying yielded slow but steady progress in recognizing and describing the relevant form classes. For example, they gave, at an early date, a relatively complete inventory of the plural forms but had to work long and hard at making headway in the obviative.

The gradual improvement which is noticeable in the missionaries' description of these languages parallels the progress of the missionary movement as a whole, until both come to a slow-down later in the 18th century.

The Appendices feature a list of manuscript materials available in this field and give excerpts from unpublished manuscripts. Microfilm $3.55; Xerox $12.40. 274 pages.

THEORIES OF ILLUSION AND DISTANCE IN THE DRAMA: FROM LESSING TO BRECHT

(Order No. 61-3439)

Ursula Liebrecht Jarvis, Ph.D.
Columbia University, 1961

A terminology relating to distance and illusion has moved into the critical spotlight since Bertolt Brecht began to explain his dramatic theory in terms of the principle of Verfremdung. However, Brecht was by no means the first German to be interested in this type of question. Since the middle of the eighteenth century, when German literary criticism came to age, a large number of dramatists, or critics primarily concerned with the drama, had developed theories as to the nature, function and desirability of illusion and distance in the theater. It is the intention of this thesis to examine these theories in the light of certain basic questions: What is the nature of the illusion required for a successful experience of the drama? How does it relate to the concept of distance? What is meant by breaking illusion? What circumstances endanger illusion? Why do certain "disillusioning" techniques fail to operate? Is there a typical context for certain characteristic attitudes and, on the basis of the latter, are any illuminating relationships between theorists or types of theory disclosed?

The investigation begins with the views of Gotthold Ephraim Lessing and Moses Mendelssohn in the eighteenth century and continues with an analysis of the clearcut and decisive definitions of aesthetic illusion and distance formulated by Friedrich Schiller. The characteristic attitudes of the romantics Friedrich and August Wilhelm Schlegel are examined, and the relatively insignificant pronouncements of Ludwig Tieck are briefly surveyed. Friedrich Hebbel and Otto Ludwig are considered together as symbolic realists, though the latter's concept of "jury distance" is quite different from anything suggested by Hebbel. Richard Wagner's doctrine of opiate illusion is analyzed, and in order to clarify the frequently obscure statements of Arno Holz, Emile Zola's Le naturalisme au théâtre is briefly considered. Additional "modern" perspectives are afforded by the study of Hermann Bahr, the Expressionists, and Hugo von Hofmannsthal.

As a result of this record and analysis, it is possible to consider Brecht's theories of distance and illusion in the tradition which had developed about these terms and concepts in the preceding centuries. Brecht is seen to combat three aspects of illusion, not always clearly differentiated: 1) deception, 2) opiate illusion, and 3) traditional aesthetic or poetic illusion. Brecht insists that his dramas have a special relation to truth which is tested pragmatically rather than by likeness to a model: truth is that insight which, when used as the basis of action in the real world, works. Such freedom vis a vis a real model justifies the use of techniques of indirect representation which allow the drama to testify, in a louder voice than does reality, to the changeability of the socio-political world. In this context Brecht intends to minimize empathetic identification with any single point of view within the action, and to prevent the kind of poetic or familiar atmosphere likely to inhibit the spectator's sceptical response. Among the most important elements thought to serve this goal are free perspectives, non-likeness representation, shock effects, and the isolation of those factors Brecht wants to stress. These and other elements interact closely and do not, as the thesis demonstrates, always achieve the ends desired by Brecht.

The thesis concludes with a clarification of thought and terminology which is intended to contribute to a clearer understanding of the role of distance and illusion in all dramatic theory.

Microfilm $5.75; Xerox $20.50. 451 pages.

THE POEMS AND SHORT STORIES OF EDGAR ALLAN POE: THEIR COMPOSITION, PUBLICATION, AND RECEPTION.

(Order No. 61-3187)

Ralph Clarence Kennedy, Jr., Ph.D.
University of Arkansas, 1961

Major Professor: E. L. Rudolph

This dissertation is a synthesis of information about the poems and stories of Edgar Allan Poe. It is based on books, articles, and annotated editions of his work.

The format of the dissertation is designed to render all material readily accessible. There are individual articles about fifty-two poems arranged alphabetically by title, followed by similar articles on seventy stories. Each article has a section on composition, one pertaining to publication, and a third regarding the reception of the work. The only exceptions to be found are in the articles about poems or stories for which some of the information is unavailable.

Under Composition the reader will find the date and place of composition if known; otherwise he will find a discussion of the available evidence and opinions by various scholars. In the same division is a discussion of the genesis and development of the work. This deals with inspiration, motivation, experiences and external circumstances which helped shape the work, and the time devoted to its composition. The discussion of sources and influences supplies suggestions and theories as to the literary materials which were utilized by Poe. He was a voracious reader of current newspapers, magazines, and books, and most of his stories are very close in style and content to the popular reading matter of his day. Poe's poems also closely reflect his reading, but his models are usually other poems, especially those of the romantic writers.

The division devoted to publication lists the appearances during Poe's lifetime and immediately following his death. It also includes known facts and stories about payments he received. Textual problems and revisions which Poe made after original publication are treated under text and revisions.

The section on reception summarizes opinions of Poe's contemporaries of the work. Comments on Poe as a person or his work in general are not included; neither is there any discussion of posthumous comment or interpretation.

The appendix consists of alphabetical listings of the poems and stories, including all of the titles under which they were published. The bibliography is confined to studies which were employed in the writing of the dissertation.

For the teacher or student of Poe this dissertation should provide easy access to much of what is known about the composition, publication, and contemporary reception of Poe's poems and stories.

Microfilm $6.05; Xerox $21.40. 474 pages.

CORNEILLE AND DRYDEN: THEIR THEORIES OF DRAMATIC POETRY.

(Order No. 61-3131)

Richard Kendall Leeman, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor G.N.G. Orsini

The fact that John Dryden (1631-1700), in his Essay of Dramatic Poesy (1668), made little use, at least doctrinally, of the Trois Discours (1660) and other critical prefaces of Pierre Corneille (1606-1684) has discouraged scholars from investigating a possible rapport of their dramatic theories. This discouragement frequently has been strengthened by the assumption that, as practicing poets, wholly involved with problems and polemics of the moment, both Corneille and Dryden in fact held no articulate theories of drama and indeed refused or, in the case of Dryden, were incapable of such formulation.

With the aim of examining this assumption, the first chapter of this dissertation chronologically studies the letters, poems, plays and prefaces of Corneille, dividing his career into five convenient periods. His writings are revealed to be informed and unified by a conscious defense of an autonomous poetic power, variously called by him "imagination" and "invention," which is freely able to express or modify experience solely according to its own nature and the artistic exigencies of its subject.

By comparing, in the second chapter, Corneille's dramatic principles with those of his lifelong antagonists, the classical critics Jean Chapelain and the Abbé D'Aubignac, we confirm the fact that it was an aesthetic and not merely a poetic or dramaturgy which separated Corneille from these contemporaries. Moralistically motivated, the classiques insisted that a dramatic poem, in order to reform, had to be based on opinion or likeness of truth (verisimilitude), whereas Corneille, whose goal was primarily that of pleasing the auditor, insisted that the dramatic poem be founded on real nature (the truth). As a result the former desired a strict control of the imagination and the exploitation of its ability to delude, whereas Corneille sought the freedom of the imagination to invent images which, though fictional, nevertheless communicated reality and not merely its shadows.

Examining Dryden's basic intellectual convictions, the third chapter demonstrates that his so-called "scepticism" was, not a radical or Pyrrhonist scepticism of reason, but mainly a distrust of dogmatic generalization, deeply rooted in an empiricist epistemology, inspired primarily by the New Science of the Royal Society of London. By the means of this Baconian inspiration, he was able to disentangle himself from most current philosophical systems, informing his criticism by the empirical philosopher's wish to investigate rather than deduce nature, to hold the mind to nature and the reason to experience. Similar to his distrust in dogma was his distrust of the poet who tries to "comprehend" nature with a literal copy or imitation rather than to imaginatively "represent" it by means of a fictional departure from the "merely probable." Complementing this was Dryden's sustained affirmation that the primal poetic faculty is an active imagination with its original power, counseled by the judgment, to find and combine images that modify experience in such a way as to form a delightful representation of nature itself. In contrast, the "rules" of imitation, being only "mechanical" and "probable," could be suspended at the poet's will and need.

Comparing their views, the fourth chapter reveals that Corneille and Dryden were remarkably alike in their independence of major neo-Aristotelian dogmas, especially those concerning dramatic imitation (the question of truth and the verisimilar), dramatic function (the question of pleasure and moral effect), and dramatic production (the question of imagination and prescriptive rules). This coincidence can be explained by similar temperaments, characters, social and economic circumstances, and historical situations, but primarily by the fact that each writer was heir to "climates" of naturalistic thought indebted to Montaigne for a distrust of dogma and formal method in favor of the cultivation of individual experience, transmitted to Dryden through the Baconian tradition and to Corneille through the libertine philosophy of Theophile de Viau and his associates. Microfilm $5.70; Xerox $20.05. 445 pages.

VARIATIONS ON ELEGIAC THEMES: DRYDEN, POPE, PRIOR, GRAY, JOHNSON.

(Order No. 61-3538)

Donald Charles Mell, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Maurice O. Johnson

My intention in this study is to examine Dryden's "To the Memory of Mr. Oldham," Pope's "Elegy to the Memory of an Unfortunate Lady," Prior's "An Epitaph," Gray's "Sonnet on the Death of Richard West," and Johnson's "On the Death of Dr. Robert Levet" to show the great variety of structure and range of feeling possible within a fundamental elegiac mode.

In the Introduction I briefly trace the changing interpretations of the term "elegy" in literary history. Despite these various interpretations we find characteristics common to all elegies and persistent aesthetic problems peculiar to such poems. The Augustan elegy is part of a continuing tradition. Terseness, simplicity, formality, conventionality, and detachment in the fully objective presentation of experience mark the Augustan elegists' personal signature.

I study these five elegies as independent structures of meaning, and consider outside factors, such as biography, intellectual milieu, sources, or genre, only as they add to the total imaginative view mediated through structure. Assuming that the poet's attempt to organize and unify disparate experience into a satisfying and meaningful whole is a constant in all good poetry, I try to determine the kind of unity achieved in each poem.

In Chapter I, "John Dryden: A Classical Elegy," I show how Dryden develops his dual themes of praise and literary criticism by combining diction, sound, metaphor, and allusion in the form of a classical elegy. His elegy to Oldham is poised, controlled, and a fine example of his own theory of propriety between thoughts and words.

In contrast to Dryden's elegy on his poet-friend, Pope commemorates a fictitious lady as an excuse to write about ambition, justice, the nature of poetry, and the role of the poet in society. Chapter II, "Alexander Pope: An Elegiac Exercise," is a discussion of the many different ways the elegist can respond to the paradoxical aspects of mortality. The urge by the living to resolve the contradictions inherent the fact of death is reflected in Pope's various elegiac solutions. The unity of the "Elegy" is in its variety.

In Chapter III, "Matthew Prior: A Humorous Elegy," I point out how Prior, like both Dryden and Pope, responds to loss in death as it affects life. His commentary on death is really an ethics of life. But he is further removed from his subject than either Dryden or Pope. This distance is a result of the ironic mask of simplicity and nonchalance pervasive throughout. Prior's octosyllabic rhythms emphasize the hopeless state of the fictitious couple he views humorously yet sadly.

Chapter IV, "Thomas Gray: A Stylized Elegy," brings us back to an elegy, like Dryden's, written to a poet-friend. Close to West in life, Gray seems detached in his sonnet because of the conventionalized imagery and phraseology. With characteristic artistry, however, Gray makes the impersonal personal and the usual memorable.

In Chapter V, "Samuel Johnson: A Christian Elegy," I argue that Johnson's elegy exemplifies successful integration of all poetic elements discussed in the other poems. He permits a full play of conflicting attitudes toward Levet's acknowledged peculiarities, praising him as a symbol of Christian charity in a hopeless world filled with inevitable disappointments, yet recognizing that he is somehow ridiculous. Beginning in despair and ending on a faint note of hope, the elegy embodies a multiplicity of feelings about and interpretations of death.

Since aesthetic distance is necessary in a successful elegiac poem, in the conclusion I discuss how the poets achieve both detachment and engagement in their elegies.

Microfilm $3.15; Xerox $11.05. 241 pages.

THE SUBLIME PURITAN: STUDIES IN THE VICTORIAN ATTITUDE TOWARD MILTON.

(Order No. 61-3459)

James Graham Nelson, Ph.D.
Columbia University, 1961

Anyone familiar with the literature of the Victorian period is aware that the life and work of John Milton elicited varied responses from every sizable and significant segment of the society. Laborers, scientists, clergymen, and politicians, all had something to say about the man whom Macaulay referred to as "the poet, the statesman, the philosopher, the glory of English literature, the champion and martyr of English liberty." And whether the public-at-large agreed with Macaulay or believed with Gerard Manley Hopkins that Milton was "a bad man," it felt the impact of the poet whom DeQuincey, in 1839, described as "a power amongst powers."

The multiplicity of opinion itself may lead us to ask whether there could possibly have been a Victorian attitude toward Milton. Yet it can be said that just as the whole is the sum of its parts, the Victorian attitude is simply the aggregate of the many views which the period saw expressed. We cannot know how the Victorians, in general, regarded Milton merely by studying what the critics said, or by laboriously tracing every instance of Miltonic influence that can be found in the poems of the period. On the contrary, one must determine the Victorian attitude toward Milton by a delineation and discussion of (1) the dominant opinions, and (2) the most significant views (which are not necessarily the most prevalent ones).

During the nineteenth century, two epithets were more constantly than any others applied to Milton: "sublime" and "Puritan." In the chapter entitled "The Religious Epic and the Miltonic Sublime," the full import and significance of the nineteenth-century use of "sublime" is discussed and elucidated primarily in connection with the now almost forgotten, but once very popular, religious epics of the 1820's and 30's which were written by Robert Montgomery, John Abraham Heraud, Robert Pollok, Phillip James Bailey, and others. In "Milton the Puritan: Pro and Con," the term "Puritan" with its varied nineteenth-century applications to Milton is interpreted and illustrated in considerable detail.

Milton's direct influence (when it is significant) on the poetry of the period from about 1830 to 1900 is the subject of several chapters, especially "The Miltonic Sonnet," and the chapter which deals with the religious epics. "Milton and Tennyson" is a study of the impact of Milton's poetry and poetic ideals on the major poet of the Victorian age.

In addition to the attitudes reflected in these chapters, the curious but widespread nineteenth-century contrast between Shakespeare and Milton is examined in the chapter, "Shakespeare and Milton," and the chapter, "The Miltonic Sonnet."

A general description of Milton's fame and popularity--illustrated by copious quotations from memoirs, letters, novels, and periodicals--serves as an introduction. The concluding chapter, "Milton the Artist: a Late Victorian View," notes the decline in popularity of Milton, the great religious-philosophical poet, and the rise in esteem of Milton, the artist, with special emphasis on the fact that Milton's influence and vogue were mainly dependent upon a small group of poets and critics such as Matthew Arnold, Robert Bridges, Gerard Manley Hopkins, Coventry Patmore, and John Addington Symonds who valued him for his conscious artistry, his metrical brilliance, and his affinity to the classics, especially the great Greek poets.

In general, the various attitudes surveyed tend to show that Milton's life and work were popular throughout the nineteenth century although the basis of his fame and influence shifted from an interest in his religious beliefs or his political opinions to a concern for his superb artistry. Popular as he was, Milton was often praised with reservation and caution, and there was no small amount of outright condemnation and utter disregard of his person and his work.

Nevertheless, the fact remains that Milton was practically a household word, so to speak, among the Victorians, and his poetry survived the later nineteenth-century decline in the religious imagination because, like all great poetry, it exhibits, like a kaleidoscope, aspects forever various and new. When the grandeur, sublimity, and enigmatic character of Satan failed to attract attention, and the religious notions in Paradise Lost became passé, Milton's consummate artistry continued to attract admirers. Microfilm $3.60; Xerox $12.60. 278 pages.

RALPH GRIFFITHS AND THE MONTHLY REVIEW

(Order No. 61-3461)

Norman Edwin Oakes, Ph.D.
Columbia University, 1961

In 1749 the London bookseller Ralph Griffiths founded the Monthly Review, a periodical designed to give its readers information on all the new books and pamphlets. During his next fifty-four years as editor of his journal, he did much to improve the general quality of reviewing and developed editorial methods and procedures that were imitated by practically all of his competitors and successors. Based mainly on the correspondence between Griffiths and his reviewers, this study attempts to describe those methods and procedures.

Probably the chief innovation made by the Monthly's editor lay in the organization and recruitment of his staff. He was not content to rely on hack writers in London to

prepare the materials for his periodical, but rather attempted to assemble a highly qualified group of specialists who submitted their reviews from points as distant as Edinburgh and Amsterdam. Every aspect of Griffiths' life furnished recruits for this staff--his dealings as a bookseller, his Presbyterian religious convictions, and even his family connections. As time went on, many others became regular contributors on the basis of recommendations by reviewers already writing for the Monthly. Though Griffiths preferred candidates personally known to him or his writers, he also occasionally took on new hands who made direct applications, but only after he had made a thorough investigation into their backgrounds.

In assigning work, Griffiths was usually guided by his staff organization. This meant that he made every effort to get a book into the hands of the staff member most qualified to handle it. If a contributor made a request to review a publication, Griffiths allowed him to do so whenever possible. Unfortunately, from time to time he also allowed his own biases and partialities (Whiggish in politics and liberal Dissenting in religion) to influence his assignments. In such instances he either prepared the review himself or had it done by a writer who would carry out his wishes.

Once Griffiths had decided who was to do an article, he had to procure the reviewing copy and forward it, not always an easy task in the eighteenth century. Booksellers ordinarily did not furnish such copies, though they did sometimes lend them to Griffiths. Often either he or a staff member had to buy a publication in order to review it. Moreover, since forwarding materials was a slow, uncertain process, it was hard for the editor of the Monthly to hold his out-of-town reviewers to a deadline. As a result, there was usually no set time that passed between the publication of a work and the appearance of its review. Over the years the interval became longer, largely because of the tremendous increase in the number of works to be noticed.

When the finished articles were returned, Griffiths checked their facts, style, and sentiments very carefully. This phase of his work was made easier by the fact that the reviews consisted mostly of summary and extract, their chief objective being to characterize rather than criticize. Also included among his duties were the arrangement of the articles, proofreading, and payment of the reviewers. Payment seems to have been a complicated process. Rates varied a great deal, being largely determined by the experience and bargaining powers of the contributor. Although two guineas a sheet was apparently the standard rate, some reviewers received as much as five pounds a sheet.

Everything considered, the Monthly was a one-man review during most of the half century that Griffiths edited it. Its success was his success.

Microfilm $3.20; Xerox $11.25. 248 pages.

A DIFFERENT DRUM: THE IMAGE OF THE NEGRO IN THE NINETEENTH CENTURY POPULAR SONG BOOKS.

(Order No. 61-3577)

Cecil Lloyd Patterson, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Hennig Cohen

The problem was to determine what image of the Negro was presented by the nineteenth century popular song books and to ascertain the relation of that image to the portrait of the Negro in a selection of other nineteenth century writings.

The method was a content analysis of certain song books and other writings of the nineteenth century. The procedure was to collect a representative sample of song books and other writings and compare the image of the Negro they presented. The sample consisted of approximately 260 nineteenth century popular song books and 96 other writings representing both "popular" and "elite" literature of all the major forms except the essay. The bases of comparison were the time the categories of the image appeared, the physical portrait presented, the character traits portrayed, and the themes expressed.

The findings were: In both the songsters and the other writings most references to the Negro were during the middle decades. During the 1840's most presentations of the physical portrait were unflatteringly comic. In the fifties, the descriptions of the physical features of the man ceased, but descriptions of the woman's became non-comic and complimentary. Both the songsters and the other writings pictured the Negro as endowed with exceptional musical ability, a distinctive sense of humor, a carefree disposition, and a great capacity for loyalty. Each pictured him as both benefited and oppressed by his enslavement. Some of the songs appeared in the literary works, and some of the other writings appeared in the songsters.

The conclusions were: Most references to the Negro were in the middle of the century. A change to comic presentations occurred in the 1840's; then a shift to non-comic delineations appeared in the 1850's. Descriptions of the physical features differed by sex with the portrait of the woman changing from unflattering to complimentary, and details of the man's appearance merely ceasing to be mentioned. The image remained static in quality after the 1850's. The general image was one of an exotic and inferior being. At the period of his greatest popularity, the Negro was cast as a counterpart of the white man in the songs. The occurrence of the Negro in both the songsters and the other writings paralleled his impact upon the nation's consciousness. The character of the image reflected the country's attitude toward the Negro, and the place he occupied in the songsters and the literature reflected his position in society. Both the songs and the other writings presented the same image of the Negro. Neither copied from the other; rather both reflected attitudes of America toward the Negro.

Microfilm $3.45; Xerox $12.15. 268 pages.

WILLIAM HAZLITT: THE STRUCTURE AND APPLICATION OF HIS CRITICAL STANDARDS.

(Order No. 61-3393)

Elaine Plasberg, Ph.D.
Boston University Graduate School, 1961

Major Professor: Morton Berman

The dissertation argues that Hazlitt's writing is organic, with staunchly held principles directing any subject he touches upon, and that his criticism of literature and the fine arts is not only based upon consistent artistic standards, but is also closely related to his criticism of contemporary theories of reform and his criticism of the philosophies of association, materialism, and utility. The dissertation outlines the social, psychological, and philosophical theories upon which Hazlitt's aesthetic is based, presents his critical standards, defines his more elusive terminology, and, finally, views him as an affective critic.

The Introduction examines difficulties that have heretofore prevented extensive scholarly interest in Hazlitt's critical theory.

Chapter I, "Hazlitt and the Psychology of Reform," discusses Hazlitt's disagreement with the Godwinian reformer and presents Hazlitt's psychological approach to the principles of "human action" and his own program for reform: of social institutions, of the race as a whole in its outward behavior, and of the individual. The chapter emphasizes the importance of "feeling," not only as a persuasive means of reform but also as an instinctive test of truth.

Chapter II, "The Philosophical Basis of Hazlitt's Aesthetics," shows a non-transcendental Romantic consideration of the meanings of "truth" and "value." The complexity of nature, of truth, and of the human mind results in Hazlitt's laying stress upon concreteness as opposed to abstraction, upon "sympathy" as opposed to subjectivity, and upon intuition as opposed to analysis. The chapter also defines Hazlitt's various uses of the term "abstraction" and concludes with a preliminary discussion of the creative imagination and the place and function of art.

Chapter III, "Objectivity and Passion," sets forth Hazlitt's theory of sympathy as a requirement for the artist and defines five gradations of "gusto."

Chapter IV, "The Concrete and the Ideal," defines Hazlitt's several meanings of "ideal," discusses and qualifies his requirement of "reality" as the object of imitation and "realism" in the work, and indicates his preference for art that is credible, universally significant, and "proper" for its audience.

Chapter V, "Unity and Complexity," discusses composition in terms of unity, substance, and symbol. The last part of the chapter, concerned specifically with poetry and the sensibility required for its creation, defines Hazlitt's several meanings of "poetry."

Chapter VI, "The Real, the Fanciful, the Essential, and the Exalted: Fiction in Four Kinds," shows Hazlitt's standards applied directly to Chaucer, Spenser, Shakespeare, and Milton. The chapter examines the four poets not so much according to the genres in which they write but according to the distinct world each portrays, the manner in which each goes about his task, and, subsequently, the distinct psychological and/or moral effect each mode of art may have upon its audience.

Chapter VII, "Hazlitt and the Shakespearian Morality of Art," summarizes and evaluates Hazlitt's aesthetic. His critical standards are interpreted to be at once mimetic, expressive, and pragmatic. Shakespeare is viewed as the artistic and moral touchstone for Hazlitt's criticism, a criticism that, far from divorcing aesthetics from ethics, unites them. Finally, Hazlitt's sustained if skeptical defense of the moral efficacy of art is examined in terms not of its historical but of its permanent value.

Microfilm $3.95; Xerox $13.75. 305 pages.

BEN JONSON'S MODERN LITERARY REPUTATION AS A DRAMATIST (1925-1958).

(Order No. 61-3375)

James Gerard Sweeney, Ph.D.
Boston University Graduate School, 1961

Major Professor: Albert Gilman

This dissertation analyzes Ben Jonson's literary reputation among English and American critics from 1925 to 1958 by examining biographical scholarship, general studies of Jonson's drama, and criticism of the individual plays. It discusses the most important contributions of modern scholarship and describes the major traditions and conclusions constituting Jonson's contemporary reputation.

The extensive biographical study shows a growing admiration for Jonson as man and writer. The Herford and Simpson, Palmer, and Chute biographies subordinate the traditional flamboyant gestures, fiery temperament, personal and professional discontent to a sober, solid portrait of a complex, attractive human being--one thoroughly representative of the English Renaissance. The most important shorter commentary authenticates key episodes in the life record.

Modern appraisal of the general literary ideals Jonson followed is comprehensive and often illuminating. It concludes that Jonson's allegiance to classical drama was only partial and never slavish, and it proves that his enormous scholarship, far from being a pedantic display, had a dramatic function in his work. L. C. Knights and many others show that Jonson's artistry and his mordant social comment enrich his realism and raise it from the level of a photographic report. Critics such as Helena Baum discover an increasingly sophisticated manipulation of the satire in the plays.

Study of Jonson's method concentrates on structure, characterization, and language. The inconclusive discussion of structure describes it variously as completely Renaissance, unmistakably classical, made up of unifying comic conceits, or the approximation of a magnetic field. Snuggs and Bauer diminish the importance of the humours in Jonson's characterization; other critics, evaluating the characterization according to historical development, type, or individual, demonstrate its subtlety and originality. Modern scholarship establishes the precision, richness, and basically English nature of Jonson's language. Lengthy analysis by Barish, Sackton, and Partridge shows its dramatic effectiveness and discovers that the powerful irony inherent in the rhetoric and imagery demands a complicated moral judgment from the reader.

The modern report on the individual plays differs for each. Critics continue to praise Every Man in His Humour for traditional reasons. The entrenched critical displeasure over the three comical satires is no longer unanimous, for Campbell, Talbert, Gilbert, and others argue convincingly that Jonson has here created coherent and effective satirical comedy.

The most significant modern critics of Volpone, Barish, Nash, and Weld, enhance its status by proving that its structure is integrated and that it is a genuine but deeply moral comedy. Epicoene, because of its unreconcilable tones of savage and light comedy, has declined in critical favor. Every important study of every aspect of The Alchemist reaffirms its reputation for excellence. The status of Bartholomew Fair, however, is ambiguous. Critics fluctuate between admiration for its rich, topical comedy and annoyance over the confusing plot and clumsy structure.

Critics continue to view the final comedies with indifference. Although Herford, Simpson, and Partridge detect excellent details in dramatic technique, they do not modify the prevailing judgment of total failure.

Both rehabilitation and rejection mark criticism of the tragedies. Extended study of Sejanus' structure, characterization, and language revitalizes its reputation; appraisal as satirical or political tragedy clarifies its intention and coherence. Jonson's use of sources in both plays is adjudged creative rather than pedantic; otherwise, Catiline attracts little praise. It is condemned as a cold, unmoving play, failing in every particular.

Modern critical judgment of Jonson is favorable. It arises from a complex and sympathetic appraisal; it discovers new areas for study; and it takes into account Jonson's subtle intention and technique. As a result, modern criticism has produced a most comprehensive and penetrating knowledge of the man and his work.

Microfilm $6.20; Xerox $22.05. 487 pages.

JOHN STUART MILL'S PROBLEM: THE UNSUCCESSFUL RECONCILIATION OF THE INDIVIDUAL WITH SOCIETY.

(Order No. 61-3566)

Powell Stackhouse Thomas, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Morse Peckham

John Stuart Mill's writing is in accord with the time-honored purpose of prose. Particularly significant about his prose, moreover, is the fact that few writers in the nineteenth century have equalled him in the conveying of thought-provoking messages with social purport. For this reason alone Mill deserves the earnest consideration of the twentieth century student. His ultimate social significance particularly impresses the present-day student interested in the maintenance of democracy.

The relationship of the individual to society is the essence of an understanding of and an appreciation for a greater democratic relationship of mankind. Mill must have been conscious of this necessary aspect of democratic government, or would he so constantly have concerned himself with the relationship of the individual to society in many of approximately 900 prose utterances--official letters, letters to editors, leaders, essays, reviews, and books--that he furnished, usually without much solicitation, to nineteenth century periodical organs and other media?

While this thesis necessarily has confined itself to direct or, at least, reasonably obvious references to this problem, the totality of indirect reference might also be adduced to show that this problem of relationship was a major concern of Mill's voluminous writings.

Procedures employed in this thesis are not particularly peculiar. Of more than ninety per cent of Mill's writings in various libraries in the United States--photostats and original periodicals--many of which were either unsigned or simply designated by a letter such as "A," "D," or "M," the frequency of Mill's concern for the establishment of a line of demarcation between the sphere of the individual's happiness and the region of the collective interest of society is more than coincidental.

John Stuart Mill never decided with finality the ideal adjustment of these two complementary, contrasting factors. His necessarily equivocal position is well stated in one of his last, little known essays, "On Social Freedom."

> Whatever may be our estimate of the absolute value of freedom [synonymous with individual action], we cannot but profit by gaining a clear insight into the various causes of the limitations [society's] which restrict our freedom [as individuals], . . . and by accurately discerning those limits beyond which we cannot hope to extend our freedom without doing away with those conditions which render life valuable to us.

This excerpt re-echoes passages from On Liberty; the following will suffice for a summary consideration of Mill's problem of reconciliation:

> . . . the practical question, where to place the limit--how to make the fitting adjustment between individual independence and social control--is a subject on which nearly everything remains to be done.

If the validity of the phrase "a criticism of life" be allowed, Mill's attempted adjustment of the individual to society is as real today as it always must be in countries desirous of promoting a more democratic relationship of mankind. This so highly coveted relationship Mill was conscious of, but its solution he never attained--probably because he either was too honest to make finite sociologic intangibles or because he could not equate whatever in practicing democratic relations must remain in a state of flux.

Microfilm $2.75; Xerox $7.60. 164 pages.

AMERICAN AND BRITISH PERIODICAL CRITICISM OF CERTAIN NINETEENTH CENTURY AMERICAN AUTHORS, 1840-1860.

(Order No. 61-3411)

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Major Professor: Edward Wagenknecht

The purpose of this study was to examine the criticism of a representative group of nineteenth century American authors (Bryant, Poe, Holmes, Whittier, Cooper, Hawthorne, Melville, Simms, Sigourney, Southworth, Whitman, and Thoreau) in about a dozen representative British and the same number of American periodicals during the years 1840-1860, with the intention of presenting through summary, paraphrase, and quotation, a cross section of the criticism and of discovering, if possible, the similarities in and differences between the two bodies of criticism.

A number of conclusions emerged. The British criticism was not unduly harsh, unfair, condescending, or colored in any significant way by a general anti-American feeling or a feeling of superciliousness. There were exceptions, to which I feel the Americans gave the undue attention and currency that exceptions usually receive. The American criticism was not influenced by strong feelings of nationalism to the point of being unduly gentle, exaggerated, or chauvinistic, although, here again, there were outstanding examples of these attitudes, to which the writers of the day gave more notice than they deserved. American criticism did not take its cue from and wait upon the pronouncements of the British before it dared to commit itself. On the contrary, it was almost without exception earlier than the British reactions in the case of specific American works, was sometimes different from the British criticism, and was cited occasionally by the British themselves. This is not to say that American critics were independent of British influence. Given a powerful and ancient tradition and culture, a similar system of education, and the same language, the Americans inevitably adhered to many of the same standards and were influenced by the same background. It is therefore difficult to say that there is a distinct and characteristic American criticism. Religious, political, class, geographical, and aesthetic influences affect judgments within each of the two bodies of criticism. As a result, divisions are often more marked on these lines than on strictly national ones. For example, the denominational magazines on both sides of the Atlantic seem to have more in common in their treatment of ethical and didactic issues than they have differences because of their national origins; and the political liberals of England and America have more in common with each other than with their conservative countrymen. Sectional differences within the status often seem as great as those between America and Britain.

So much, however, for the differences. What seems significant to me is that, when these many and considerable differences are admitted and noted, the British and American criticism generally ignored national, sectional, political, religious, and other boundaries and presented evaluations that are surprisingly similar. Moreover, concerning Bryant, Poe, Holmes, Whittier, Cooper, Hawthorne, Sigourney, and Southworth, the judgments were quite close to those of today's critics. On the other hand, bewilderment and frequently condemnation resulted when new ways were marked out. Cooper's attempts to express and establish for America social, economic, political, legal, and religious standards in his later works, were not given the sympathetic understanding and study they now receive. Poe's use of symbol and the consistency of his ideas were not understood fully. Melville was far beyond most of his critics, particularly in Moby-Dick, Pierre, and some of the tales, leaving the reviewers to lament as abortive these productions of one they recognized as a genius. Whitman failed with his contemporaries for similar reasons, although the question of morality was of great importance in his failure. As for Thoreau, the form in which he worked, his limited output, his untimely death, and the subversiveness of his doctrines worked against widespread acclaim or popularity. However, even among these most militant and unpopular innovators, critics to match their vision were not wanting.

Microfilm $6.15; Xerox $21.85. 482 pages.

THE SCHOLAR GYPSY: GEORGE BORROW AS LAVENGRO (1803-1844)

(Order No. 61-3478)

Donald Alan Wolf, Ph.D.
Columbia University, 1961

George Borrow, who is best known as the author of Lavengro, The Romany Rye, The Bible in Spain and Wild Wales, is himself the central figure of these works. Since his self-portrait is romanticized, no one who is interested in Borrow's work can fail also to be interested in the reason for and the extent of his romanticizing. But anyone who depends on existing studies of Borrow is more likely to be confused than enlightened. Writers who treat Lavengro and The Romany Rye as factual autobiographical documents tell rather more than all that is actually known about Borrow. Those who regard Borrow as a charming liar misunderstand his intention and accomplishment. Those who use Borrow and his work as the material for psychoanalytic studies are most successful in demonstrating the pitfalls of amateur psychoanalysis.

A comparison of Borrow's self-portrait with that drawn by contemporaries does much to support the view that the greatest danger of misunderstanding him is to fail to believe him; and the history of the composition of Lavengro and The Romany Rye shows that they were originally planned as autobiographical companions to The Bible in Spain. But as he was writing Lavengro Borrow evidently discovered that the cost of public confession was too great and decided to turn what he had first called his "life" into a "dream," a term he used because he disliked "novel." Not only did he thus safeguard his pride and privacy but he gained an artistic freedom which enabled him to capture the quintessence of his recollections of England during the Regency.

Significant parts of this experience are Borrow's relation to his father; his intimate acquaintance with common folk, rogues and gypsies; the sufferings which accompanied his rise in social status; and a crisis of conscience which he could never permanently resolve. Rebelliousness,

ambition and time itself committed him to the nineteenth century; but familiarity, affection, loyalty and independence made him prefer the past. As the result of an abortive attempt to establish himself as a writer, he happened to rediscover this past in the English countryside, where the world that Matthew Arnold lamented as dead was still alive. Later a fortunate coincidence sent Borrow to Russia and Spain, countries which had yet to come to terms with modernity.

The two chief aspects of Borrow's experience are thus both interesting in themselves and illuminating in their relation to major intellectual and emotional conflicts of the nineteenth century. But it is not merely the material which accounts for the interest and significance of his work: Borrow's style is no less effective than his subject matter. Artless by calculation it too embodies his vision of individuality, freedom and oneness with nature. It was the harmony between matter and form that enabled Borrow to distinguish himself as an original writer; and in large part it is a consequence of this same harmony that Lavengro, The Romany Rye, The Bible in Spain and Wild Wales have long been regarded as minor classics.

Microfilm $3.55; Xerox $12.40. 274 pages.

LANGUAGE AND LITERATURE, CLASSICAL

HISTORICAL COMMENTARY ON CASSIUS DIO 54

(Order No. Mic 61-2018)

Brother F. Boniface Bender, F.S.C., Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor William C. McDermott

Although Cassius Dio is one of the most important literary sources for the study of Roman history, there has not been a commensurate amount of critical attention devoted to him. It is particularly in the area of historical commentaries on Dio that this deficiency is most evident. The present dissertation aims to remedy in part the deficiency by supplying a historical commentary on Book 54 of Dio's History.

The text used for the commentary is the Greek text of E. Cary in the Loeb Classical Library. This edition was checked for significant variations with the Boissevain and Teubner texts.

Book 54 of Dio contains thirty-six chapters. In the present dissertation selected portions from each of the chapters were chosen for comment.

The procedure of operation in this study is as follows. At the beginning of each chapter there is given a short summary of the events contained therein. The various notes of commentary are then given in order, each comment being preceded by a translation of the relevant passage.

Not every single verse is chosen for comment, but an attempt was made to have every major item represented. Particular care was taken to identify the various persons mentioned in the text. Where possible, a brief sketch of their careers was given.

Chronologically Book 54 takes in the years 22 B.C. to 10 B.C., a period of consolidation by Augustus of his power at home and abroad. The commentary on Dio's account of these years includes, therefore, items such as the source and extent of Augustus' power in Rome; the wars of pacification in Spain and Gaul; the military conflicts with the Germans; revolts in the Danubian area; the journeys of Augustus to the provinces; and the various domestic problems in Rome itself.

The outcomes resulting from a study such as the present are several. The main benefit lies in the fact that a student of the Augustan period of Roman history can now read with more understanding the work of one of the chief historians of the period. Moreover, most of the comments furnish bibliographical references to works, both ancient and modern, in which more detailed information can be found.

A second result of this commentary is the reassessing of Dio's position as an historian, judged particularly from the standpoint of accuracy and reliability. The introductory portion of the dissertation takes several specific statements of Dio in Book 54 in which Dio is found to be in conflict with other authorities. Analysis of these statements indicates that in general Dio displays considerable accuracy. There are a few minor errors of fact, such as the location of a temple or the naming of an aqueduct, but the over-all reliability is good.

The study did reveal that confusion on Dio's part was likely to arise more in certain areas than in others. For example, the greatest chance of error lay in the field of constitutional questions. Dio ascribes to Augustus offices such as praefectus moribus which Augustus himself says he never assumed.

In the matter of proper dating of events it was found that Dio is usually correct, although he is not always precise. If, for example, a military campaign extended over several years, Dio is likely to assign it to just one of those years. Microfilm $2.80; Xerox $9.70. 215 pages.

STUDIES IN THEOCRITUS' PASTORAL IDYLLS

(Order No. 61-3880)

Daniel Enoch Gershenson, Ph.D.
Columbia University, 1961

This dissertation aims to fill a gap in Theocritean scholarship and in the study of pastoral poetry in general. Pastoral is a creation of the Hellenistic age in which Theocritus lived; accordingly, the study of the poetry of Theocritus is a contribution to the understanding of Hellenistic poetry. One of the earmarks of the literary productions of the third century B.C. is the absence of philosophical speculation. This has often been taken to mean that the authors of this period no longer considered themselves teachers of men and that they had become interested only in entertaining their readers. On the other hand, the difficulties of the style developed at this time make it clear that the poets then were poetae docti, whose works could be appreciated by only a small audience. Through

a detailed examination of the movement of the poetry in some of the idylls of Theocritus, I have tried to show that the origins of pastoral lie in Theocritus' use of certain learned motifs in connection with certain beliefs he held about the world and the manner in which he ordered types of experience on a scale of value.

When the pastoral poems (11, 1, 5, 7, 3, 6, 10, and 4, in the order I have treated them) are carefully scrutinized, it becomes clear that their subject is erotic and that they attempt to examine divers aspects of the relation of love, in its various manifestations, to song, i.e., to the creation of poetry. Theocritus has a "program" of art and life; the charge that his poetry is beautiful but incoherent, pleasurable but lacking order and clarity is baseless. He is the poet who searches for and finds the struggles of life transformed into a peaceful agon and ultimately into love, in the countryside.

Microfilm $2.75; Xerox $7.60. 163 pages.

THE COMMENTARY OF RABBI DAVID KIMHI ON THE BOOK OF JOSHUA
[Hebrew Text]

(Order No. 61-3433)

Nathan Goldberg, Ph.D.
Columbia University, 1961

This work presents a critical edition of the Commentary on the Book of Joshua by Rabbi David Kimhi, celebrated grammarian, lexicographer and exegete, who lived in the Provence ca. 1160-1235. Here, on the bridge between the Iberian peninsula and Western Europe, Kimhi assimilated the diverse fruits of the labors of the Spanish schools to the south and the Franco-German academies to the north, with the result that his own work came to be a blending of the philological and philosophic studies of the former and the traditional Talmudic learning of the latter. Later generations applied to him a felicitous word-play on Pirke Abot 3:21 -- "Without Kimhi there could be no correct understanding of Scripture."

Kimhi's works enjoyed wide popularity and played an important role in Bible translations from the early sixteenth century to the present time. Kimhi's widespread influence is discussed; his commentaries and other works are described; his sources and treatment of them and his method of presentation are examined.

This Edition of the Commentary on Joshua is based on five fourteenth- and fifteenth-century manuscripts and the three earliest printed editions. The text is not eclectic but is based on the best of the early texts consulted and is accompanied by an apparatus of variant readings and notes of Kimhi's sources. Additions to the Commentary found in the early editions and manuscripts are included in an Appendix; shorter additions and glosses are included in the apparatus of variants accompanying the text. The work also includes Kimhi's Introduction to the Former Prophets in which he outlines his method of exegesis; here, too, Kimhi gives his view on the origin of the keri and ketib of the Massoretic Text.

In his exegesis Kimhi employs reason and grammatical rules to arrive at the natural meaning of the text (peshaṭ). Frequently he adduces other Biblical verses and the Targum to determine the correct meaning. But he is not strictly a literalist; he often quotes the Targum where it embodies a Rabbinic interpretation (derash) at variance with the literal sense; he repeatedly cites homiletical interpretations from the Talmud and Midrash. Kimhi does not, however, repeat Rabbinic traditions slavishly; he frequently disagrees with a view that he quotes. The Commentary is the source of Midrashic material not found in any extant collections. A follower of Maimonides, Kimhi often attempts to explain miracles rationally.

Biblical verses quoted in the manuscripts and early editions are frequently inaccurate; this is doubtless due to the fact that Kimhi quoted from memory and errors were compounded in scribal transmission. It is also suggested that Kimhi may have misquoted Biblical verses deliberately in keeping with the prohibition against reproducing words from Scripture. Quotations from the Targumim often do not correspond to the texts in our printed editions and could be a valuable source for a critical edition of these works. In many instances, however, the quotations in the manuscripts are hopelessly garbled.

The different manuscripts and editions consulted for this work are described in detail; the relationship among the different texts is studied; and the source of the Commentary in our present editions is traced.

The bulk of the Appendix is made up of additions to the Commentary introduced by the editor of the Leiria edition (1493). Many of these additions are from the Commentary of Rashi and were inserted in Kimhi inasmuch as the edition did not contain Rashi's commentary. The quotations are generally fuller than the Rashi in our printed editions and may represent a different recension of Rashi or may include glosses. These will need to be examined by an editor of a critical edition of Rashi on Joshua.

Microfilm $2.75; Xerox $7.20. 154 pages.

CICERO'S ORATORICAL CAREER

(Order No. 61-3551)

Robert George Schettler, Ph.D.
University of Pennsylvania, 1961

Supervisor: Prof. William C. McDermott

Histories of Latin literature, including such major studies as those of Teuffel-Schwabe-Warr, Schanz-Hosius, Rose, Duff, and Hadas, vary in the numbering of Cicero's speeches. The three major editions of the speeches and fragments, those of Orelli-Baiter-Halm, Mueller, and Schoell, are also in disagreement. There was, therefore, a need for a chronological study of Cicero's oratorical career incorporating the results of former investigations and evidence heretofore not systematically developed so far as it pertains to Cicero's oratorical career.

The chief evidence for Cicero's oratorical career is, of course, Cicero himself. Many direct and indirect references to delivered speeches are found in his speeches, letters, and, in a smaller degree, his essays. The secondary sources are the ancient commentators on Cicero: Quintilian, Plutarch, Asconius, Nonius Marcellus, the

scholiasta pseudoasconianus, the scholiasta Bobiensis, the scholiasta Grenoviensis, the rhetores Latini (in Halm), and the grammatici Latini (in Keil). Valuable notes are found in modern Ciceronian studies and editions of selected works.

For the purpose of narrative, Cicero's oratorical career is divided into seven periods: 95-81 B.C., 81-71 B.C., 70-67 B.C., 66-63 B.C., 62-60 B.C., 59-47 B.C., and 46-43 B.C. The speeches are discussed individually in three appendices. The historical background of each speech is given, the subject is summarized, the sources are given, and pertinent problems are discussed and, when the evidence permits, resolved. The first appendix includes fifty-nine speeches wholly or in large part extant. The second appendix includes fifty-nine speeches extant in minor fragments or in title only. The third appendix includes one-hundred and fourteen speeches not listed in the major editions of the corpus. A fourth appendix summarizes the results in a chronological table of Cicero's oratorical career.

The results make clear that the speeches of Cicero in their published form need not necessarily represent the entire oratorical activity of Cicero in that particular case. While some of Cicero's speeches were definitely written out in full before delivery, most of his speeches were written after and not for delivery. Thus, some speeches were written out in revised form after delivery, sometimes incompletely, sometimes with additions or omissions, sometimes in abridged form, and sometimes only in outline. It is also evident that some of Cicero's speeches were not written out at all.

The conclusions of the study indicate that a history of Cicero's oratorical career must include at least one-hundred and fourteen more speeches than have been listed in studies or editions of Cicero's oratorical works.

Microfilm $3.90; Xerox $13.75. 301 pages.

LANGUAGE AND LITERATURE, LINGUISTICS

LAFAYETTE FRENCH PHONOLOGY: A DESCRIPTIVE, COMPARATIVE, AND HISTORICAL STUDY OF A LOUISIANA FRENCH DIALECT. (PARTS I AND II).

(Order No. 61-3495)

Marilyn Jane Conwell, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. A. G. Juilland

This dissertation is divided into two parts: (1) the phonology proper, (2) the texts which have formed the basis of our analysis, accompanied by detailed information on the informants. The phonology and texts are part of an exhaustive analysis of the phonology, morphology, syntax, and lexicon of Lafayette French, to be published in full in the near future.

Acadian French might be best described as a rural dialect which, under the influence of English, has diverged from Standard French (SF). The designation Lafayette French (LaF) refers to the Acadian French dialect spoken within a fifteen mile radius of the city of Lafayette, Louisiana. This area, determined by linguistic homogeneity, includes portions of three parishes, Lafayette, St. Landry, and St. Martin.

Our materials were collected in context, through tape-recorded informal conversations. All styles of speech, recitation, formal speech, conversation, and song, are represented. A considerable variety of subject matter is covered, e.g., farming, schooling, church activities, domestic problems, amusements, etc. Exhaustively transcribed, the tape recordings were submitted to a thorough analysis. Selections included in Part Two were grouped into nine sections on the basis of socio-cultural interest.

Of the original thirty-five persons interviewed, twenty-four are represented in our selection. Informants range in age from ninety-five to ten, sixteen being fifty or older. Half have had negligible or limited schooling; three have had higher education. Twelve occupations are represented, e.g., housewives, cabinetmaker, storekeeper, priest. Half of the informants speak predominantly French; less than half can read and write French.

Our treatment of phonology envisages the supra-segmental or prosodic features and the segmental or properly phonologic entities. Supra-segmental features are examined with respect to the prosodic units they determine, i.e., pulse groups or syllables, stress groups or phonetic words, pitch groups correlating with clauses, and breath groups correlating with sentences. In the second section, segmental entities or phonemes, as well as their combinations, are examined from three points of view: descriptive, comparative, and historical. In the descriptive section, LaF phonology is described in its own terms. In the comparative section, the phonologic facts of the dialect are grouped with reference to SF. In the historical section, facts are grouped with reference to the factors which condition changes from SF to LaF.

Our investigation indicates that LaF does not differ from SF phonologically as much as has been suggested. The essentially different features can be grouped into four categories, with reference to the four factors most conducive to change: stress, nasalization, symmetry of vocalic distribution, and simplification of phonemic groups.

A greater proportion of stressed syllables per phonetic word is observed in LaF, hence a greater proportion of long syllables, stress being characterized by length rather than by intensity. There are also many doubly accented phonetic words. Through the action of stress, diphthongs are split, mute [ə] is retained, vowels are lowered, dental and velar stops are softened, and modulated pitch groups are created within intonational contours.

Inverse nasalization increases the ratio of checked to unchecked syllables and promotes inter-word syllabic relations. Oral vowels are frequently nasalized by anticipation.

High vowels are consistently selected in unchecked syllables, low vowels in checked syllables. The higher nasal vowels tend to replace the lower ones.

Combinations of phonemes are reduced, especially in word-final position, as are diphthongs and complexes. Hiatus is frequently eliminated by elision.

Many of the changes observed in LaF are paralleled in SF; LaF has evolved more rapidly than SF, and patterns inherent in SF have been more consistently generalized. According to present information, LaF is a relatively conservative Louisiana French dialect.

Microfilm $5.85; Xerox $20.75. 460 pages.

THE ASSINIBOINE LANGUAGE

(Order No. 61-3532)

Norman Balfour Levin, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Henry M. Hoenigswald

Assiniboine, a member of the Missouri river group of the Siouan stock, is primarily spoken in Alberta and Saskatchewan, Canada, as well as in Montana. This work concerns itself with a descriptive analysis of the Assiniboine spoken on the Fort Peck Reserve, Montana. Data for this study were gathered by the writer during extended field trips to the Fort Peck Reserve from 1958 through 1960.

This study consists of two parts, an analysis and texts. In scope, the analysis ranges from phonemics to morphology-syntax as follows.

Phonemics treats the segmental phonemes p t č k š x h s ž g z m n w y i į u ų e o a ą. The inventory of the suprasegmental phonemes includes: the accent phoneme, and three juncture phonemes--open transition, the pause, and the intermittal pause.

An analysis of the data revealed seven different types of morphophonemic changes which treat the more productive alternations. These relate to nasalization, fusion of sounds, and loss of sounds.

Inflection of the nominal themes are defined in terms of morphologic and syntactic criteria. The nominal theme consists of four noun classes: the animate noun, the inanimate noun, the adjective noun, and the adverbial noun.

The process of verbal inflection is characterized by affixation of personal morphemes and verbal suffixes. The classification of the verbal theme depends upon the form of the personal morpheme and the verb stem.

The main grammatical processes for noun derivation are compounding and affixation. A listing of the more productive nominal affixes are given.

Verbs are derived from other verbal and nominal themes by morphological processes of affixation and reduplication. The important submorphemic verbal elements and additive verbal elements are listed.

The last section deals with syntax. The minimum syntactical elements are classified as to form and function. The predicate is divided into two categories. The macropredicate has as its head constituent, a noun form, a verb, or a nominalized construct, functioning as the predicate. The micropredicate consists of the interjection. The six main types of noun phrases, coordinate, appositional, determinate, possessive, and postpositional, are described.

The conclusion illustrates, by the use of examples extracted from the text, specific descriptive problems to be further investigated.

The second part of the study, the texts, consists of the bulk of supportative evidence on which the analysis is based. The texts are monologues, dialogues, and direct responses which students of anthropology and sociology will find of interest.

Microfilm $3.25; Xerox $11.50. 251 pages.

THE INTERPRETATION OF ENGLISH STOPS AND INTERDENTAL FRICATIVES BY NATIVE SPEAKERS OF HUNGARIAN

(Order No. 61-3896)

William Joseph Nemser, Ph.D.
Columbia University, 1961

This study investigates the interpretation of English stops and interdental fricatives by native speakers of Hungarian. The comparative analysis of relevant parts of the phonological systems of the two languages suggests certain general implications of the fact that the tenuis-media distinction is tense-lax in English but voiced-voiceless in Hungarian, and that the latter system lacks an interdental fricative pair.

Summaries of the theoretical formulations of Einar Haugen and Uriel Weinreich are included since these views underlie most current approaches, both speculative and empirical, to problems of linguistic convergence. A survey of earlier experimental investigations of instances of language contact is also presented.

An extensive series of perception and rendition tests of the discrimination, identification, imitation and production varieties were designed and administered to a group of native speakers of Hungarian with a limited command of English.

The results of these tests indicate that native speakers of Hungarian tend to perceive the English interdentals as labial fricatives, to produce them as stops, and to imitate them as either sibilants, stops, or labial fricatives.

A very small number of errors occurred in the interpretation of the localization features of the stops. The error rate in the interpretation of the tense-lax distinction was also very low, even in final position where the unvoicing of the English lax stops might be expected to lead to the confusion of members of the stop pairs. On the other hand, defective renditions of the aspiration feature of English initial stops were very frequent.

A large proportion of the responses on both the stop and interdental tests were not identifiable with the phonemic patterns of either English or Hungarian, but were reflexes (or reflex sequences) of intermediate phonetic quality and indeterminate phonemic status.

In the succeeding section of the study it was demonstrated that, in light of the test results, the revision of certain tenets of language contact theory is necessary. Specifically it was shown that these results could not have been predicted on the basis of a dialinguistic analysis in terms of any current linguistic formulations. Moreover, many aspects of these results, notably the radical discrepancies between the perceptual and productive responses to interdental stimuli, but also variations within these patterns, cannot be accommodated by present contact theory.

Finally, certain hypotheses providing for the interference phenomena observed are offered. A hypothesis is

proposed of bilingual phonological structure as comprising related but independent sets of receptive and productive patterns with varying degrees of resemblance to the phonological patterns of the languages in contact. A further hypothesis of elliptical perception is suggested to account for the frequent association of dissimilar perceptual and productive patterns.

Microfilm $3.50; Xerox $12.15. 270 pages.

VERBAL CATEGORIES OF THE POEMA DEL CID

(Order No. 61-3788)

George Wesley Wilkins, Jr., Ph.D.
Tulane University, 1961

Chairman: Bernard Gicovate

The Poema del Cid has been intensively studied from the point of view of the historical philologist: the problems of authorship, date of composition, meter, rhyme, sources, structure and language have already received a great deal of attention. There are still many unsolved problems concerning the syntax of the poem, however, especially regarding tense usage and tense sequence. The only descriptive study of the language of the Cid, Louise Hatch Wester: "A Structural Analysis of the Epic Style of the Poema del Cid," (Unpubl. diss. U. of Illinois, 1953), undertakes no analysis of the syntax, and previous studies have failed to find systematic use of the narrative tenses of the past, for example.

This dissertation is an analysis of the verbal categories of the first canto, using the methods of modern descriptive linguistics. By verbal categories is meant tense, mood, voice, person and number as shown in formal contrast. The objectives were to define the verbal categories of Old Spanish as represented by the Cid, to compare them with modern Spanish, and to make a historical statement of any differences and similarities that exist. The technique employed to establish ultimate contrast was the classification of the inflectional suffixes of the verb according to their syntactic environment, and the latter in relation to the timebase within which it occurred; timebase is defined as the relationship of an action to the moment of speech, i.e., past or non-past.

Neutralization of the contrast of tense and aspect markers was the most striking phenomenon observed in the verb system of the Poema del Cid, a system which otherwise offered few differences from modern Spanish. It was found, however, that elements other than tense-markers showed temporal and aspectual contrasts. These were either temporal adverbs, tense markers of other verbs, or the timebase itself. Thus it is possible to explain from the linguistic point of view why certain usage is permissible within the language system: the choice of a given form is then a matter of style. An important point discovered concerning the use of imperfects for preterites is that only imperfects in -aba are so used. This clearly indicates a systematic usage as opposed to tense confusion.

Microfilm $2.75; Xerox $7.00. 146 pages.

LANGUAGE AND LITERATURE, MODERN

TENNESSEE WILLIAMS ON STAGE AND SCREEN

(Order No. 61-3482)

Ertem Asral, Ph.D.
University of Pennsylvania, 1961

Supervisor: Gerald Weales

This dissertation is a study of Tennessee Williams's works in two media: the stage and the screen. The changes made in translating the playwright's ideas, dramatic techniques, and aesthetic goals from stage to cinema are due, basically, to differences between the two media as art forms and to differences between the values of the theatre and movie audiences.

Like the play, the film is a visual, verbal and aural medium. However, on the stage, drama is largely unfolded by words; on the screen, by visual image. The dialogue of Williams's plays is rearranged and shortened for the film. Due to the mobility of the camera, the author's characters gain motion, while, at the same time, the scene of action is broadened. The language of the camera becomes the substitute for the writer's descriptive powers. An expansion of action is expected in any film adaptation, but in The Glass Menagerie it effects a major change in the character of Laura and thus in the play itself. Because cinema is primarily a realistic medium, the non-realism of Williams's settings is partly or entirely lost in their transference to film. The expressiveness of the playwright's devices which rely so much on stylized lighting is diminished on the screen. Among the filmic devices frequently used in the screen adaptations of Williams's plays are dissolve, montage, fade-in and fade-out, and close-up.

Frequently the conspicuous changes made in adapting the plays to cinema are due to differences in the nature and values of the theatre and movie audiences. A playwright is less limited than the author of a motion picture because the former's audience is smaller in size and less varied in character. To be a financial success a screen story must stay within the emotional and psychological understanding of its audience, which comprises differences in sex, age, race, residence, education, occupation, religion, and political orientation. With the possible exceptions of A Streetcar Named Desire and Suddenly Last Summer, Williams's plays that probe into human psychology and neurosis are simplified, the problems that beset the characters are externalized and explained for the understanding of the mass audience. The best example to such simplification is Cat on a Hot Tin Roof, in which the emphasis is shifted from Brick's spiritual paralysis to the necessity of love in the family. The screen rendering of Williams's works also tends to be more moral than their originals. Besides simplicity, sentimentality, and moralizing, the mass audience likes happy endings--a fact that is duly recognized by Hollywood and imposed upon the film versions of The Glass Menagerie, Cat on a Hot Tin Roof, and Suddenly Last Summer. Since in deciding about going to a certain movie people are influenced by its cast, the star system plays an important role in the motion picture industry. Certain adjustments are made to fit the roles to the personal qualities of the stars. Finally, there is

the problem of censorship, which has caused the elimination of the theme of perversion from A Streetcar Named Desire and Cat on a Hot Tin Roof.

Each chapter is devoted to the study of one stage play and its simultaneous comparison with its film translation. Frequent references are made to Williams's dramas, which have not yet been filmed, to short stories, one-act plays, and poems that provide further insights into his themes, characters, and art.

Microfilm $4.30; Xerox $15.30. 336 pages.

HISPANO-CLASSICAL TRANSLATIONS PRINTED BETWEEN 1482 AND 1699: A STUDY OF THE PROLOGUES AND A CRITICAL BIBLIOGRAPHY

(Order No. 61-3486)

Theodore Sterling Beardsley, Jr., Ph.D.
University of Pennsylvania, 1961

Supervisor: Arnold G. Reichenberger

Our purpose is to establish the totality of Spanish translations of the Classics printed during the indicated period and to examine the prologues to those translations in order to discover the Spanish attitude toward the Classics. The dissertation is divided into two parts. Part I consists of a chronological, numbered listing of the first editions of the translations with accompanying annotations listing reprints and investigating particular problems; the annotated listing is followed by a chapter evaluating the publication data and including considerations of literary patronage, Greek studies, and lacunae. Part II consists of an analysis of the prologues divided into three parts: Prologues before 1500, Prologues of the 16th Century, and Prologues of the 17th Century. In the first part each prologue is treated separately; thereafter, subdivisions according to the reigns of monarchs are made, and within these the prologues are examined according to the following considerations: Christianization, Hispanization, Prodesse et delectare, Style, History versus Poetry, and Studia humanitatis. Part II is followed by a concluding chapter incorporating the results of the investigations reported in Parts I and II. The appendices include a chronology of first editions and reprints, an index of Classical authors translated, and an index of translators.

The statistics of published translations indicate the following facts: the periods during which Spanish translators of the Classics are most active are the reign of Juan II (1406-1454), the period of influence and early reign of Felipe II (1550-1575), and the reign of Felipe III (1598-1621); the period of greatest activity for translation from Greek as well as that which witnesses the translation of the broadest range of disciplines is the early reign of Felipe II; the monarch to whom the largest number of translations is dedicated is Felipe II; the poetic masterpieces of Classical literature do not appear in force in Spanish until the reign of Felipe II; the Classical authors whose works most often translated and reprinted in Spain are Aesop, Ovid, Vergil, Seneca, Cato, and Cicero; those whose works are notably absent or seldom present are Plato, Homer, and Lucretius.

Examination of the prologues to translations reveals a pattern similar to that of the history of published translations. Prior to the reign of Felipe II, translators invoke the concept of praefiguratio as justification for the doctrinal values of Classical works, but they are careful to point out various errors in Classical thought; during the latter half of the 16th century the doctrine of praefiguratio is supported by natural theology, and with the introduction of the aprobación cautionary elements in the prologues diminish; preference for historical fact and mistrust of fiction notable before 1550 change to a balanced attitude toward both categories in the latter half of the century; praise of the virtues of eloquence and the doctrine of prodesse et delectare is most evident in the latter half of the 16th century. After 1600 the prologues reflect the literary polemics of the period in which the Classicists often find themselves in open warfare with the advocates of Culteranismo but occasionally in alliance with the partisans of conceptismo. As the century progresses, respect for the literary and moral values which sustained the popularity of the Classics and which were in turn supported by the example of Classical literature subsides and with it the popularity of the Classics in Spain.

Our major conclusion is the establishment of the third quarter of the 16th century as the quantitative, qualitative, and ideological high point of the influence of the Classics in Spain according to the history of published translations and to the testimony of the translators.

Microfilm $4.35; Xerox $15.30. 340 pages.

THE SATIRE OF CHARLES CHURCHILL: A CRITICAL STUDY.

(Order No. 61-3425)

Hyman Herbert Datz, Ph.D.
Columbia University, 1961

This dissertation attempts a critical evaluation of the satires of Charles Churchill in the light of recent studies of satirical methods and conventions and with as little attention as possible to the personal and historical background of the satires. In his own day the most feared of satirists, and considered by many of his contemporaries as a not unworthy successor to Alexander Pope, Churchill has received relatively little attention from scholars and critics in the two centuries since his death. The supposed immorality of his personal life has alienated many writers who have regarded him as an instance of "Satan accusing sin"; the satires have frequently been dismissed as both too political and too much concerned with personalities to be of enduring interest; and Churchill is often depicted as an artless and malicious lampooner rather than a satirical artist. In T. S. Eliot's view, the satires are merely "blundering assaults."

A just evaluation of Churchill's satires must begin by our making a rigid distinction between Churchill himself and the speaker in the satires. Churchill was aware that he was writing in a particular genre, and he recognized the exigencies of this genre. The "I" of the satires is a deliberately constructed character; he is portrayed as a highly virtuous man of uncompromising literary, moral, and political integrity, constantly striving to be just and

impartial in his distribution of praise and blame and animated by reason and justice in his unselfish warfare against corruption for the good of his country, which is depicted as pre-eminent for its vice and folly. The superior virtue of the persona is an ancient and inevitable convention of satire; upon it rest the authority and the duty of the speaker to castigate the faults of others, and it serves to win the reader's respect for and assent to the satirical strictures. That there may be a discrepancy between the known character of the poet and that of his persona is an interesting but irrelevant biographical fact which must not be allowed to affect our evaluation of the poems, as it so frequently has in writings on Churchill.

Most of Churchill's satires have their roots in the political events of the early 1760's, during which time Churchill assisted John Wilkes in his attacks on the ministry of Lord Bute. But the satires are more than mere historical documents; Churchill has successfully subdued their partisan aspect and generalized his attacks into a warfare against tyranny and in support of freedom. Moreover, in satirizing such men as Hogarth, Sandwich, and Warburton, Churchill touches lightly on their political sins and achieves the ideal in satire of making the victim a type of viciousness: Hogarth is an example of the effects of vanity and meanness on a great talent, Sandwich is the epitome of presumptuous depravity, and Warburton is the archetype of the self-seeking worldly priest. We can appreciate the satires with no knowledge of the rights and wrongs of the controversies which led to Churchill's enmity towards these and other persons. Similarly, the numerous allusions to now forgotten individuals in Churchill's works are frequently used to give an air of concrete particularity to general remarks; their function in a given passage is usually clear, and no external information is necessary to understand the point of many allusions.

Hogarth painted Churchill as a "burly bruiser"; the epithet has clung to him for two centuries. But Churchill, despite his ability to hit hard and mercilessly, took a good deal of care in his satiric attacks. These are seldom direct or spontaneous; his usual method is to place the attack within a framework and to employ various kinds and degrees of irony. Churchill has his obvious faults as a satirist and poet; but a close study of his works shows that he is a more conscious and skillful satiric artist than he is usually given credit for being.

Microfilm $3.30; Xerox $11.50. 254 pages.

SOCIAL SATIRE IN THE NARRATIVE PROSE FICTION OF THE EARLY EIGHTEENTH CENTURY

(Order No. 61-3496)

Ernest Howard Hunter Davis, Ph.D.
University of Pennsylvania, 1961

Supervisor: Maurice O. Johnson

This thesis attempts to analyze the function of social satire as it was developing in England during the first forty years of the eighteenth century; and from this it attempts to shed some light generally on the proper functioning of satiric techniques in this genre. Since the elements which this literary species was gathering to itself were more distinct during these years, the function of satiric techniques in these elements can be more strikingly bared. As the novel developed, the elements which it had incorporated by 1740 (the letter, the travelogue, the Character, and others) became less important per se; and the functioning of satire through these elements more obscure. For these reasons the narrative prose fiction of this short period is of peculiar value to the present study.

The use of David Worcester's excellent rhetoric, The Art of Satire, as a basic critical lens achieves a uniformity of terminology and aesthetic attitude and prevents a confusion which would be unavoidable otherwise. In using this method the author in no way means to imply that he thinks this approach the only one; naturally there are other critical approaches to this subject which would yield somewhat different results. On the other hand, this analytical method does yield definite and significant conclusions.

For one thing, this study reveals that the author who employs satire is usually operating from an emotional bias which is likely to cause him to lose aesthetic control of his material. Characters will speak out of character, plots will suffer from the improper focusing of events, and the scenes will be given disproportionate value. This emotional background is further reflected in the close correlation between satiric technique and subject matter. A satirist is more likely to use his favorite technique to deploy his favorite subjects, most of the time at the expense of aesthetic judgment. In this respect the more accomplished writers, Richardson and Fielding, for example, reveal their quality through their control. And finally it is clearly demonstrated that the presence of satire will necessarily interfere with the basic function of the novel– the creation of a fictional world. Just as a didactic moral mars the art of a poem by introducing an extraneous element, the presence of satire blemishes the novel by forcing something of the real world upon the artist's fictional one.

The novel, then, does not lend itself to satire, particularly the more specific forms of social satire; and the novelist who dares employ it does so at his peril, for it is nearly impossible for him not to lose some of the aesthetic distance so vital to the proper functioning of an artist.

Microfilm $3.90; Xerox $13.75. 301 pages.

THEMES AND LITERARY TECHNIQUES IN THE FICTION OF FRANK NORRIS

(Order No. 61-3499)

William Byron Dillingham, Ph.D.
University of Pennsylvania, 1961

Supervisor: Hennig Cohen

The purpose of this thesis is to examine closely the themes and literary techniques in the fiction of Frank Norris, first to indicate what they are and how they function and then to show that they are all commonly related to Norris's anti-intellectualism. Chapter I attempts to reconstruct briefly the picture of Norris's world and to place him in the strong current of anti-intellectualism.

Chapter II analyzes and traces two of Norris's favorite themes: the role of instinct in life and the importance of chance in man's existence. The first of these themes takes

various forms. Norris deals with the difference between real feelings and false or intellectualized emotions. Frequently he depicts the superficiality of environmental influence as compared to hereditary drives. His interest in racism, atavism, and degeneracy stems from this concern with the basic role instinct plays in man's life. Closely related to the subject of human instincts is chance as a mover of men. Characters in Norris's fiction are often creatures of very deep drives which they cannot control, but they are also moved from without by the mysterious force of chance. Together, these forces are the most powerful and the most basic in the universe.

Chapter III treats several subjects which may appear diverse: Norris's love of the big city as reflected in his stories; his dislike of the dilettante; his respect for masculinity and for the man who does well his "work" in life. These and other subjects, however, are actually related. They are all a part of Norris's belief in the invigorating force of life's main stream. Like Hawthorne, Norris envisions a dim future for those who isolate themselves from the life around them.

The similarity and difference in the themes which are discussed in Chapters II and III are apparent. These various subjects of Norris's stories all reflect an underlying conviction that feeling in man is more basic than intellect. But to say that Norris recommends our realization of the superior power of instinct and further points to the dangers of withdrawing into a world of intellectualism presupposes his belief in free will. He frequently shows characters enslaved by corrupt instincts. Vandover and McTeague, for example, are not illustrations of characters who willingly do the wrong things with their lives. They can do nothing but what they do because of the overwhelming force of instinct. The theme which in its many manifestations is traced in Chapter III, therefore, is somewhat incongruous with those themes of Chapter II. Norris at times writes of the overpowering influence of instinct and chance in our lives and then in other places implies how man should act on his own. There is no clear "growth" from one of these ideas to another in Norris's career. The underlying consistency, however, is in his anti-intellectualism, the source for both groups of themes.

Chapter IV is devoted to Norris's virtues and weaknesses as a literary craftsman. From an analysis of style, pictorial technique, characterization, tone, symbolism, and other aspects of his fiction, certain conclusions are apparent. First, Norris was unusual in the span of his achievement. From A Man's Woman to McTeague is a distance almost incomprehensible. In style, symbolism, and in other areas, Norris could be astonishingly successful at one time and miserably inept at another. Secondly, Norris's bias against intellectualism and aestheticism both aided and hindered him as an artist. For example, he was so impatient with stylists like Walter Pater and Henry Harland that he wrote too rapidly and revised too little. Yet his style is sometimes fresh and intense in its spontaneity. Thirdly, despite Norris's own dictum, he was to some extent a conscious artist.

Microfilm $2.75; Xerox $8.00. 175 pages.

DOSTOEVSKY AND THE BROTHERS KARAMAZOV, IN ENGLISH, 1879-1959.

(Order No. 61-3184)

Floyd Eugene Eddleman, Ph.D.
University of Arkansas, 1961

Major Professor: Robert L. Morris

This dissertation is a compendium of the reactions of English and American readers to the impact of The Brothers Karamazov over a period of about eighty years. Also included are the opinions of European commentators whose works have been translated into English and have had significant effect upon English-speaking critics of The Brothers Karamazov. Some of the opinions reveal insight and great critical acumen; others are superficial and merely imitative of accepted views about the novel. This collection of literary opinions is not selective, nor is it in accordance with any preconceived standard of judgment. Its catholicity should be proof of the power of the Dostoevsky masterpiece to excite and stimulate a great variety of thinking.

The first four chapters contain a survey of various writers' opinions of Dostoevsky and of The Brothers Karamazov which appeared in England and America from 1879 through 1959. From the time of the first English translation of The Brothers Karamazov by Constance Garnett in 1912 to the present day, Dostoevsky's work has been regarded as a masterpiece, although there was a slight decline in the popularity of the novel in the 1920's.

Chapters V through VIII present opinions expressed about Dostoevsky's literary method (particularly in relation to the novel in question): form; plot and theme; his use of narration, tension, contrast, and humor; and a consideration of whether his method is objective or subjective, romantic, naturalistic, or realistic.

Chapters IX and X are concerned with The Brothers Karamazov as a "novel-tragedy" and with a comparison between this novel and Greek tragedy.

Chapters XI through XIV consider Dostoevsky's characters (general comments, the "doubles"), especially the major figures in The Brothers Karamazov (Old Fyodor, Dmitri, Ivan, Alyosha, and Smerdyakov), including a discussion of which character is the hero.

Chapter XV presents readers' comments about symbolism and allegory in Dostoevsky's last novel.

The trend among contemporary critics is to consider The Brothers Karamazov as a unified, complete novel, not as a fragmentary part of an unfinished work. Present-day commentators concern themselves mainly with structure, symbol, religion, freedom, and the dramatic aspects of the novel. Less attention is being given to the psychological and mystical aspects of The Brothers Karamazov.

Public interest in Dostoevsky and The Brothers Karamazov is greater than at any time since the "Dostoevsky craze" period of the 1910's. At last a new, improved translation of The Brothers Karamazov by David Magarshack has been published by Penguin Books (1958). This novel is easily and inexpensively available in both hard-cover and numerous paperback editions. Within the past twenty years at least twenty full-length biographies or interpretations of Dostoevsky and his works have appeared in England and America, only a few of them being translations. Three of these twenty books are reprints or new editions of biographies printed earlier in the century. With the present interest in Russia and her affairs, and in the study of the Russian language,

the future of Dostoevsky and The Brothers Karamazov looks promising. Dostoevsky is no one-book author. Crime and Punishment has always been popular. And in recent years The Possessed (The Devils), as well as A Raw Youth (The Adolescent), has been receiving an increasing amount of attention. But we may safely say that criticism of The Brothers Karamazov appearing in English for the past fifty years has regarded this novel as Dostoevsky's greatest and, indeed, if not as the world's greatest, at least as one of the summits of world literature.

Microfilm $8.50; Xerox $30.40. 672 pages.

CONRAD'S SEA WORLD: THE VOYAGE FICTION AND THE BRITISH MERCHANT SERVICE, 1875-1895.

(Order No. 61-3662)

Robert Dana Foulke, Ph.D.
University of Minnesota, 1961

Adviser: William Van O'Connor

Recent critics of Conrad have emphasized his sophisticated technique, his political pessimism, and his psycho-moral exploration of individuals who are alienated from the world in which they live. Iconoclastic treatment of the earlier "sea-writer" image was a necessary antecedent to serious consideration of this complex art, but the attempt to dissociate Conrad from the sea altogether--to divorce the man and his work from the concrete experience of nearly twenty years--continues long after its usefulness has passed. The influence of the sea world on Conrad's fiction cannot be summarily dismissed. He was a competent but not particularly successful officer in the British Merchant Service who drifted into a second career which we value more highly, yet he never repudiated his first career in the wholesale fashion which has now become fashionable among critics. What he did repudiate was something far more limited--the "sea-writer" label which classified him as a spinner of salty yarns--and in this he was reacting against the obtuse comments of early reviewers.

Examination of the late nineteenth-century British Merchant Service is a particularly important adjunct to Conrad criticism. Unlike Thoreau's Concord or Dickens' London, the microcosmic world of sailing-ship voyages lies beyond the normal range of our experience. By contemporary standards, life in merchant ships was indeed grim. Suspended in a limbo between old traditions and complete mechanization, men who stayed in sailing ships enjoyed neither the excitement of the fast clippers nor the safety and luxury of modern steamships. They sailed the clumsy and unmanageable "boxes" built during the last decades of the century and endured added hardships and dangers without any tangible reward. It is this remote world of sailing ships (the world of the Narcissus and the Otago) that matters in Conrad's work because he shared its life and its values for nearly twenty years.

Ignorance of the historical British Merchant Service has misled many readers into an uncritical acceptance of Conrad's statements about the sea world. Conrad outlined a "creed"--the romantic idealization of the sea, ships, and seamen--in The Mirror of the Sea, in essays, in prefaces, and in direct statements of the fiction; it serves him as a useful means of structuring his material but can seldom be identified with the themes of stories and novels as critics have so often claimed. Conrad's realistic evocation of shipboard life exists side by side with the "creed" (sometimes with marked irony), and it is for this vision of a world neither simple nor neat that we value his work. Reducing the voyage tales to moral fables of "fidelity" and "solidarity" obscures Conrad's dramatic use of voyage structure. For purposes of analysis, it is useful to distinguish voyages in which men endure the hazards of the open sea from those which explore the conscience of a single seaman. Because of its intrinsically dramatic nature, the voyage can serve as structure for tests of seamanship and stamina as well as a setting for moral dilemmas and metaphysical discoveries. The fact that Conrad is sometimes primarily interested in the voyage as a device for exploring the psyche or testing "fidelity" to opposing ideals should not lead us to misconstrue the less symbolic but equally valuable voyage tales in which "land entanglements"--the moral values of civilization as a whole--are subordinate to his interest in making us "see" men in relation to the physical facts of a harsh calling. The historical background helps us to discern in his evocation of the sea world a vision of reality no less interesting or complex than that which informs Nostromo and Under Western Eyes.

Microfilm $3.45; Xerox $12.15. 268 pages.

THE SUBJECTIVE ASPECTS IN MAUPASSANT'S WORKS

(Order No. 61-3431)

Dzintars Freimanis, Ph.D.
Columbia University, 1961

Maupassant has been called an objective author. His reputed objectivity has earned him both praise and scorn. The question arises of whether he fully deserves either. Certain writers and scholars have recognized Maupassant's subjectivity, but the whole of his literary creation has never been examined from this point of view. The purpose of this study is to consider the principal ways in which Maupassant reveals his inner self through his writings.

In deciding whether or not a mood or a preoccupation is the author's own, two main criteria are used: first, the concordance of the particular attitude with his personality; second, the frequency of its recurrence in his fiction. The problem of literary influences is not considered, because it is assumed that, whatever the sources of Maupassant's outlook on life, it may be called subjective as long as it is constant and gives a personal flavor to his works.

As for Maupassant's personality, he was sensitive, but hid his sensitivity under a mask; he was good-natured, despite some manifestations to the contrary; and he was torn between a thirst for living and a nihilistic feeling of uselessness. The latter attitude predominated.

Maupassant's personality traits mark his writings. In this study they are analyzed under the headings of pessimism, pity, love, and romanticism. Maupassant is a pessimist because life to him seems painful, deceitful,

ephemeral, and solitary. This pessimism is felt, not reasoned. The sight of other people's sufferings inspires him with a pity which he does not withhold from his stories, in spite of apparent objectivity. His main means of escape from joyless solitude is the search for love. Yet love, in Maupassant's view, can be nothing but an illusion: we embrace only the body, but we never become one with the inner being of another person. This unfulfilled, vague longing stamps Maupassant as a romantic, and certain of his moods do tend towards romanticism. Still his heroes are predominantly those of a sober naturalist, in that they do not rise above the level of common people.

The conclusion of the study is that Maupassant's works represent a world which is strongly colored by subjective attitudes. Apparently, he accepted things as they are, and that is his objectivity. But he gave them back to us enveloped in his mood of uselessness, of nothingness, and that is his subjectivity. Maupassant's reader is constantly reminded of the author's point of view: directly, through the thoughts and feelings of the protagonists and narrators; indirectly, through his choice of characters, situations and events.

Some critics have seen Maupassant's subjectivity only in a few of his later novels. This study shows that it is present throughout his literary creation. His supposedly "objective" stories yield more material to the study than his admittedly "subjective" novels, for Maupassant is never entirely outside the world he presents. In this way, he gives us his own "illusion particulière."

Microfilm $2.85; Xerox $9.90. 217 pages.

PAUL VALERY AND THE CIVILIZATION OF THE EIGHTEENTH CENTURY

(Order No. 61-3432)

Renée Golicki Geen, Ph.D.
Columbia University, 1961

Paul Valéry repeatedly stated his admiration for the eighteenth century and accorded the age what is ultimately the greatest praise: his desire to have lived his own life at that time. Four of his essays in Variété attempt to recreate various figures of the Enlightenment, and there are allusions to the period's artistic and scientific contributions in the dialogues, in his aphorisms and throughout his correspondence, while the Cahiers supply invaluable supplementary information.

Two main reasons seem to underly Valéry's preference: this "delightful moment" represented for him a desirable if fleeting state of equilibrium between two equally inacceptable extremes, the tyranny of order and the anarchy of disorder; he also thought that the Siècle des Lumières formed a perfect contrast to modern society, many aspects of which he deemed incompatible with the life of the intellect.

In both cases, nostalgia colored Valéry's view of this ideal moment. Yet whatever his remarks may lose in accuracy, they often gain in vividness, and it is their power to evoke and to recreate the age rather than their historical soundness which is invaluable to the reader.

Thus Valéry's essays on the great writers of the period can hardly be considered as thorough or objective but rather as highly personal evaluations. Valéry criticized, for instance, the harem intrigues and psychological developments of the Lettre Persanes, whereas he greatly praised Montesquieu's elliptical style and his use of the device of the imaginary traveller. Voltaire, whose poetry and theatre were almost entirely neglected, was acknowledged as a remarkable painter of history, an unsurpassed story teller and above all as a lucid literary critic. Valéry's judgment of Diderot was only partially favorable for, while he was attracted to Diderot's lack of system as a philosopher, he nonetheless deplored in him an accompanying lack of self-discipline. His attitude to Rousseau was much more categorical: he abhored him and constantly denounced Jean-Jacques's alleged "invention" of nature as a "ridiculous error," his desire to confess himself with so-called complete sincerity as a hypocritical comedy. Typically, Valéry refused to analyze Swedenborg on the mystic's own terms and gave a rationalistic solution to the "Swedenborg enigma." The speech on Goethe reflects Valéry's life-long interest in the Faust legend which was to inspire Mon Faust. A variety of other comments on the arts and sciences of the eighteenth century similarly reveal his own preferences and prejudices.

In analyzing Valéry's attitude toward the eighteenth century, we can establish some general points of comparison between the poet's thought and the spirit of that age. An unbounded yet methodical search for knowledge is characteristic of Valéry as well as the philosophes as a whole. Their curiosity is accompanied by an all-pervasive critical attitude, by a subtle sense of relativity, by the belief that abstractions are ideas devoid of meaning, that empirical deduction is the surest way to truth; hence an interest in science. Like his eighteenth century predecessors, Valéry acted as an agent de liaison between literature and science. Like them, also, he encouraged cosmopolitanism of thought.

Valéry's portrayal of the civilization of the eighteenth century has therefore a dual interest: it presents a modern and original reappraisal of the period; it can also make clear the poet's own thinking by situating it within a given cultural context.

Microfilm $2.75; Xerox $9.25. 205 pages.

THE FICTION OF NATHANIEL PARKER WILLIS

(Order No. 61-3369)

Lewis Center Goffe, Ph.D.
Boston University Graduate School, 1961

Major Professor: Edward Wagenknecht

Nathaniel Parker Willis (1806-1867) was one of the most prolific and popular American authors of his day, known for his fiction, poetry, travel sketches, rural letters, drama, and journalism. This study attempts to analyze, re-evaluate and trace the development of Willis's fiction and to account for his contemporary popularity. Because Willis is unfamiliar today, the organization of this work comprises synopses of his stories with running commentary and annotation of his many historical literary and topical allusions and with critical summaries after each section.

Inklings of Adventure (1836) contains various kinds of stories, the most successful presenting high life in America and Europe, many being accounts of Willis's travel adventures in fashionable or exotic places, influenced by Irving, Bulwer, Disraeli, Byron, Wordsworth, and Shelly. Many are digressive, introducing scenic descriptions and philosophical comment at the expense of the plot; others integrate these elements functionally. In most, the protagonist is a thinly-disguised Willis, and in many, the psychological conflicts between this protagonist and an alter ego reflect tensions in Willis's mind caused by the clash between Willis's Galvinist training and his more worldly inclinations. A few stories contain a revenge motif which may result from Willis's sensitivity to his critics. Noticeable even in this first collection is Willis's constant use of metaphor and allusion and his unique ability to record contemporary manners.

Romance of Travel (1840) contains some of Willis's most technically perfect stories: long digressions are absent; scenic descriptions and philosophical comment are functional. Satire becomes important as Willis increasingly employs social comedy. Though more from Willis's imagination than experience, these stories still reflect tensions in Willis's mind.

"Loiterings of Travel" (1845), published in The Miscellaneous Works of N. P. Willis, contains social comedy and romance. Willis begins coupling literary satire with the surprise ending, employing political satire, and making more use of introspection. He begins also to use sensitive protagonists to explore the position of the artist in society and the subtle relationships among sensitive persons in refined society.

Dashes at Life with a Free Pencil (1845) contains two parts, "High Life in Europe" and "American Life," in which Willis reveals and contrasts European and American manners. Willis captures much of the glitter of his period and reproduces it in fascinating perspective. Within his scope he was the best qualified American of his day to deal with fashionable manners in America, and he recorded the social transitions prevalent in ante-bellum America. Dashes brought to fruition Willis's tendency toward farce, but several stories deal seriously with artists whose sensitivity penetrates the more subtle experiences of life. The revenge theme continued; however, it is used primarily for humor.

Willis's novel, Paul Fane (1857), climaxes his fiction. It presents a young American artist, reared in the rarefied atmosphere of Boston, whose aesthetic sensitivity and social consciousness enable him to penetrate the masks of persons he meets to the depths of being beneath and to cut through the conventional facades to the core of human motivation thereunder. As Paul Fane encounters European manners and traditions, Willis analyses their psychological effect on his protagonist and contrasts and evaluates American and European culture. Paul Fane is an international novel antedating Henry James. Willis subdues physical action in order to concentrate on the psychological effect of experience. He uses symbol and metaphor in order to present his intellectual, social and aesthetic ideas. He reveals his own social and artistic perspectives as he analyses in detail the duty, function, method, and position of the American artist in his contemporary milieu, and he neatly sidesteps certain Victorian taboos with the delicate frankness of good taste.

Microfilm $10.35; Xerox $37.15. 825 pages.

ELIZABETH BOWEN AND THE ART OF FICTION: A STUDY OF HER THEORY AND PRACTICE.

(Order No. 61-3381)

John Greist Hanna, Ph.D.
Boston University Graduate School, 1961

Major Professor: Gerald W. Brace

The relationship of Elizabeth Bowen's critical theory to her practice has not yet received detailed treatment. Her essay "Notes on Writing a Novel" (1945), a comprehensive and revealing source of practical formulations on method, reveals her basic traditionalism and her striking individual qualities as well. It serves, furthermore, to bring her novels into relief and it suggests tentative conclusions about her place in contemporary literature.

Examined here in detail are the eight main divisions of the essay: Plot, Characters, Scene, Dialogue, Visual Angle, Moral Angle, Advance, and Relevance. Of special importance in considering each of the eight novels are the following: under Plot, "the non-poetic statement of a poetic truth," "mystification as emphasis," "action of language," and "what-is-to-be-said"; under Characters, "materialization," "unpredictability and inevitability," and "diminution of alternatives"; under Scene, "the mood of the 'Now,' " "categoricalness," "staticness," and "dramatic use"; and under Dialogue, "faked realistic qualities" and "functional use."

Four other narrative elements receive extended treatment in the "Notes"; like the foregoing, they epitomize the larger body of Miss Bowen's long-term speculations on the craft of fiction. Visual Angle includes a close analysis of her postulates on "right of entry," the "closed" character, and the film director's "authoritarianism." The term Moral Angle is examined as it relates to the author's artistic detachment, or "freedom from pre-assumptions." Advance reveals a lifelong preoccupation with narrative pace and continuity; essential to an understanding of Miss Bowen's efforts to impart forward movement are five distinct concepts: "succeedingness," "the felt consequences of necessarily omitted events," "the falsification of time," "the expenditure of the characters' potentialities," and "fresh presentation of scene." The concluding section of the "Notes," entitled Relevance, is a summary of Miss Bowen's ideas on organic unity and of the inner consistency of character, scene, dialogue, and imagery with "plot."

A close technical analysis of the eight novels in their chronological order indicates an increasingly firm relationship between Miss Bowen's theory and practice. In The Hotel (1927), The Last September (1929), and Friends and Relations (1931), structure is handicapped by imperfections in the motivation and development of character. Although the author's impressionism, evident in an excessive concern for atmosphere and sensibility, fragmentizes the action, her third novel points to a solution of these difficulties. The fourth novel, To The North, is more firmly

constructed: for the first time motives are elaborated and continuity is controlled. The intricate symbolism of the novel's setting gives the action greater unity.

In the "major" novels, The House in Paris (1935) and The Death of the Heart (1939), the rigorously controlled dramatic structure clearly indicates a closer adherence to technical theory. Outer mystification and tension effectively mirror the heroine's inner conflicts in The House in Paris, and atmosphere impinges directly on her moral dilemma. Here and in The Death of the Heart Miss Bowen develops her fullest characterizations. The effect of the latter novel is sharpened by skillful shifts in point of view, greater probability in linking action and character, and a meticulous relevance of setting to "poetic objective." Noteworthy, too, is the tonal balance between realistic satire and poetic tragedy.

The Heat of the Day (1949) parallels a number of the technical formulations on mystification and tension, the expenditure of the characters' potentiality, and "freedom from pre-assumptions."

Implicit in the form and content of the most recent novel A World of Love (1955) in Miss Bowen's disavowal of her earlier themes and theories. Her gradual mastery of sustained action, complex characterization, and discursive form is suspended here. Severely circumscribed in plot, character, and scene, A World of Love is either an over-extended short story or an underdeveloped novel. In it Miss Bowen abandons her characteristically detached irony and adopts an ardently romantic and elevated style intended to convey the effect of resurrected love letters on the lives of three women. The result is a highly atmospheric succession of moods and an almost total absence of character development. Grandiose in conception but minor in its impressionistic treatment, A World of Love merely emphasizes the validity of those principles in the "Notes" which it ignores.

Microfilm $5.00; Xerox $17.55. 390 pages.

TRANSITIONAL SHORT FICTION IN ENGLAND DURING THE 1890'S

(Order No. 61-3110)

Wendell Voelker Harris, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Carl Woodring

The literary ferment accompanying those cultural phenomena which have given to the 1890's in England their peculiar fame has more often been cited for its picturesqueness than analyzed for its essential constituents. The more singular qualities of the prose and poetry of the nineties were viewed by unsympathetic commentators of the time as garish manifestations of a temporary cultural decadence, and the seriousness with which many of the writers of that decade approached their art has continued to be largely overshadowed by the intriguing but exaggerated myth of the antic irresponsibility of the "yellow nineties." In no genre have the fundamental aesthetic intentions of the period been less recognized than in that of the short story.

This study undertakes an examination of the most significant of the many minor writers who were experimenting with the short story in the 1890's. The attempt is made to reconstruct the various literary ideals toward which these writers looked, and to elucidate the technical and formal means by which they tried to achieve their goals.

The introduction points out the manner in which a great portion of the decade's short stories have been misrepresented, sketches the characteristics of the avant-garde periodicals such as the Yellow Book, Dome, and the Savoy which welcomed and encouraged experiment in the short story, and outlines the dangers of allowing preconceptions about the spirit of the nineties to intrude upon the treatment of the fiction under consideration.

In the first chapter are traced the various forms given to the short story by the force of the ideals of that aesthetic movement which had wound its tortuous way through English literature since Ruskin. The short fiction of such diverse writers as Oscar Wilde, W. B. Yeats, Max Beerbohm, John Grey, and Richard Garnett is seen to be linked to the central impulses of this movement.

The second chapter explores the theory of the "new realism" as seen both by hostile critics and by its champions. The technical problems of the attempt to translate the ideals of this conception of realism into palpable form in the short story are outlined. Thus, for instance, the realists' aversion to artificial plotting explains the abrupt narration and episodic structure which their stories so often exhibit.

The third chapter consists of an extended analysis of the work of one of the most important of the minor writers experimenting with realism in fiction, Hubert Crackanthorpe. An analysis of the techniques and effects of the most important of the other generally neglected writers of realistic short fiction of the nineties makes up chapter four. The similarities and differences in the work of such realists as "George Egerton," Ella D'Arcy, Frank Harris, John Buchan, and George Gissing are suggested.

The several streams of romance which appear in the short stories of the decade are examined in the fifth chapter. The coy gaiety or enforced melancholy of the sentimental romance as produced by Henry Harland, Ernest Dowson, and Frederick Wedmore is contrasted with the active, virile romance embodied in the stories of Stevenson, Kipling and Wells.

The final chapter summarizes the attempts to correct the most important misconceptions about the basic tendencies of the short stories of the nineties. The meaninglessness of the term "decadence" as applied to this fiction is insisted upon, and the values of those fictional ideals which, distilled from the theories of the impressionists and of the aesthetic movement, governed the direction of the majority of the experiments in the short story in the nineties are defended by a review of their practical effects in extending the realm of the short story.

Microfilm $4.60; Xerox $16.20. 358 pages.

VISCOUNT BOLINGBROKE: AUGUSTAN HUMANIST.

(Order No. 61-3884)

Jeffrey Peter Hart, Ph.D.
Columbia University, 1961

This study is not designed to add to our biographical knowledge of Bolingbroke, but to interpret his political writings from a new point of view. Although Bolingbroke was considered by many of his most important contemporaries to be a man of extraordinary intellectual power, and though his political writings were widely admired in his own time, his reputation declined precipitously soon after his death and has been low ever since. The reason for this decline is the fact that his intentions were obscured by the victory of the very cultural and political forces against which he had struggled. He was primarily neither a political scientist nor a professional philosopher, but rather a moralist in the tradition of Renaissance Humanism. He thought of himself as an orator in the Humanist sense of that term; that is, as a man whose mastery of all significant areas of knowledge enables him to govern justly. All of Bolingbroke's important writings, furthermore, whether historical, political, or philosophical, have as their goal the inculcation of the traditional Humanist ethos.

This Humanist ethos may be traced in English culture from the reign of Henry VII. Characteristic expressions of it occur in the work of such writers as Erasmus, More, Elyot, Sidney, Spenser, Jonson, Milton, Dryden, Pope, and Swift. In its English development the tradition was closely associated with the political hegemony of the landed gentry, and was modified by the circumstances of the gentry's life. In the middle of the eighteenth century, accordingly, the literary and ethical values of Humanism were employed in the Tory campaign against middle-class commercial and urban values.

This was the strategy that informed the writings of Bolingbroke, as well as of Swift, Pope, and Gay. As part of his campaign against Walpole and the "moneyed interest," Bolingbroke wrote The Idea of a Patriot King, in its form a Renaissance "manual for the prince." Examples of this genre are plentiful in the Humanist tradition. Erasmus, Machiavelli, Elyot, and a host of other writers had produced comparable manuals. By using this form, Bolingbroke linked his political quarrel with Walpole to the larger cultural issue--the breakdown of the Humanist tradition. The Idea of a Patriot King is also an anti-Machiavel. A careful analysis of Bolingbroke's manual, and a comparison of it with The Prince, demonstrates that Bolingbroke was imitating the form of Machiavelli's manual but attempting to refute some of his principal contentions. When Bolingbroke attacks Machiavelli, he does so by returning to a traditional Humanist position. Bolingbroke, moreover, combines his attack on Machiavelli with his attack upon Walpole, and by so doing suggests that Walpole's "corruption" is not merely an example of personal immorality but the manifestation of a philosophical point of view that was subversive of traditional morality generally.

Bolingbroke has often been pictured as a treacherous politician. He aided the Pretender against the Hanoverians, then deserted the Pretender; and later he led the opposition to Walpole, allegedly for purely selfish reasons. But though Bolingbroke allied himself with widely varying political causes, his various alliances may be seen to exhibit a certain consistency of principle. In every phase of his political career, he was fighting what he called Whiggery--the domination of England by the "moneyed interest." Thus his literary career and his political career were informed by a common purpose.

Microfilm $4.75; Xerox $16.65. 369 pages.

ELIZABETHAN ATTITUDES TOWARD MUSIC IN SHAKESPEARE'S PLAYS

(Order No. 61-3888)

Harry Christian Kiefer, Ph.D.
Columbia University, 1961

Elizabethans saw in music a reflection of universal design which embraced all aspects of man's life, including his spiritual and physical environment. The well-tempered individual, body and soul; the justly governed state, especially a monarchy; the cosmic organization of the stars and planets; the mixture of the elements--all were a part of musical theoria, since they all could be thought of as musical harmony. Many Elizabethan attitudes toward music were rhetorical commonplaces; some were acquired from classical, patristic, and medieval sources, especially Boethius' De Institutione Musica; some were derived from the symbolism attached to instruments. Together they comprised a body of received musical thought, not always consistent, which in its literary manifestations declined, under the impact of science and of the rise of Puritanism, from an accepted way of understanding the universe to a collection of materials used for conventional, decorative rhetoric.

Elizabethan musical thought, especially the multiple extensions of musical analogy by which the intricate design of the universe could be perceived, appears frequently and variously in Shakespeare's plays. Sometimes it is imbedded in language; sometimes it can be inferred from a performance of music. In comedy, the harmony of love and the social harmony of "one feast, one house, one mutual happiness" prevail at the end, as they do in the "solemn combinations" of Twelfth Night and in the dancing of Much Ado About Nothing. In history, the political harmony of the state, like that which Richard II cannot achieve and which Henry V establishes, is a constant symbol, sometimes radically violated, as it is by Richard III, or conspicuously ignored, as it is by Caesar. In tragedy and romance, the larger harmony of cosmic music, with its high conception of divine order, like the "heavenly" music of Prospero and the musical ideal to which Lear's madness and the tempest of his ordeal are opposed, pervades the action. The providential reconciliations of the dramatic romances are reinforced by the celestial music that symbolically brings them about.

All aspects of musical thought are related, however, theoretically as well as in their dramatic representation. The political harmony of the state, for example, is central to the Roman plays and to Hamlet and Macbeth. Cosmic music is an artificial point of reference for Olivia in Twelfth Night, and it is the ultimate criterion violated, in terms of time, by Richard II. Moreover, throughout all kinds of plays the musica humana of the well-tempered

self--the harmony of body and soul, or the individual as a properly tuned instrument--illuminates the action, whether that harmony, like Orsino's, is damaged and restored, or, like Prince Hal's, develops and presides.

Although ornamental musical imagery is common throughout Shakespeare's work, elements of musical theoria enrich his plays chiefly by clarifying themes and by relating secondary matters, like qualities of character and details of ceremony, to the general patterns of action. An analysis of musical background therefore provides a new standpoint from which to perceive unity in dramatic conception. The personal attunement that Lear achieves is also a political and spiritual concord. The musica humana of Prince Hal is inseparable from the political harmony of England which he brings about. Hotspur's desire for rebellion, the most profound of political disorders, is a concomitant of his personal preference for cacophony. Heroines like Marina, Imogen, and Perdita are not only harmonious individuals but also sources of harmony in the society of the dramatic romances. The musical analogy that explains character therefore involves character simultaneously and ineluctably with the action and theme similarly explained.

Microfilm $3.15; Xerox $11.05. 242 pages.

GOETHE AND THE GENTEEL TRADITION IN AMERICA

(Order No. 61-3384)

Manfred Klein, Ph.D.
Boston University Graduate School, 1961

Major Professor: Erich G. Budde

From the time he first became known in America two contrasting attitudes toward Goethe have been discernible. There was on the one hand a rejection of the poet on moral and political grounds, and opposing this an appreciation of the humanist, poet, and last universal man. In general the pre-Civil War period shows a decline in the puritanic standard of judging literature and a growing appreciation of Goethe's central importance.

Of the two substantial studies of the poet in the post-Civil War period, von Grueningen deals with the attitude toward him as reflected in periodicals, and Pochmann's contribution, while encyclopedic in scope, does not attempt critical evaluation. The present investigation undertakes to explore the reaction toward Goethe of a representative group of writers in the genteel tradition. This term, coined by Santayana and widely adopted, is used here to characterize the attitude toward culture prevailing in America from 1865 to 1912. It is marked by a failure to reflect the national background, by moral timidity, cultural nostalgia, and an insistence on decorum in artistic expression. Its salutary influence lies in its transmission of the European cultural heritage.

Much of Goethe's influence during this time was in the field of literary criticism. Lowell saw him as the last of the great humanists and as the successor of the major poets of the West. He adopted the poet's canons of criticism and often his judgments on specific works. Howells, less inclined to accept him in toto as a literary and critical model, commended chiefly his theory of the novel, and repudiated his personal morality. Of the minor critics, Whipple praised him with undiscriminating vagueness, Stedman adopted many of his critical criteria, while Mabie went farthest toward providing a complete picture of the poet. Woodberry, the youngest of the group, while acknowledging Goethe's importance in modern thought, held strong reservations as to his personal character and his ideal of self-culture.

Bayard Taylor did most, through his Faust-translation and other writings, to make the country favorably aware of the German poet. His emphasis was on the integrality of the man and poet, whom he held up as a model for a materialistic America. Louise May Alcott showed a great, but uninformed enthusiasm for the poet and made superficial use of Goethe-motifs in her writing. Burroughs' interest in Goethe was episodic, and his knowledge of him limited mainly to his views on nature and scientific method. In his discussion of literary and cultural problems he drew mainly on the aphoristic remarks, largely from Eckermann.

The members of the St. Louis Group interpreted Goethe as the poet of German idealism – represented for them in its authentic version by Hegel – and presented him as substantiating in literature the philosopher's endorsement of existing institutions. Despite this bias, they made a significant contribution to a deeper understanding of the poet, especially his relation to philosophic thought, ignored by most genteel writers. Royce, rooted like them in German idealism, but vastly more erudite and original than they, had a sounder grasp of the poet's position in Western thought. He did not, however, attempt a full-scale presentation, and Goethe is represented in his work chiefly by illustrative quotations. His objections to the poet are based on intellectual rather than narrowly moral grounds, unlike most of Goethe's genteel detractors.

The image of Goethe that emerges from the study is both incomplete and one-sided. Only the "classical" works and Eckermann are praised, while all evidence of youthful insurgence and evolution of outlook is suppressed or disapproved. He is most often presented, tacitly or explicitly, as a supporter of the status quo in literature and society. A more just estimate was presented by non-genteel writers, in part by scholars, who treat him with academic objectivity. Others, like Moncure Conway and Whitman, emphasize the liberating aspects of his work and William James sees in him the healthy, scrupulously honest empirical observer. These were in the minority, but their influence tended to rectify the distortions of gentility dominant up to the beginning of the present century.

Microfilm $5.50; Xerox $19.35. 429 pages.

SCHILLER IN RUSSIAN LITERATURE

(Order No. 61-3448)

Edmund Karl Kostka, Ph.D.
Columbia University, 1961

The present study attempts to fill a gap in Schiller scholarship. It deals with Schiller's impact on Russian literature from Stankevich to Vyacheslav Ivanov covering the nineteenth and the beginning of the twentieth century up to 1905.

It was my aim to throw into relief the salient elements in each author's appreciation of Schiller: his dependence on him for guidance and inspiration or, as the case may be, his struggle with Schiller's aestheticism. I did not aim at the complete collection of all references to Schiller but rather at an incisive analysis of Schiller's importance and meaning to each author.

The Introduction gives a brief survey of Schiller in Russian literature from 1782 to the present time. It is intended to serve as background information for the detailed study that follows.

Chapter I deals with the almost legendary figure of Stankevich, the "father of Russian Westernism," who was instrumental in the introduction of Schiller and German idealistic philosophy in Russia. Under the influence of Schiller's drama Wallenstein Stankevich almost became the victim of dream-like hallucinations.

With respect to Lermontov my research led me to the conclusion that he is strongly indebted in his early plays to Schiller's Storm and Stress dramas, especially to Die Räuber and to Kabale und Liebe. In addition I succeeded in uncovering a far-reaching influence of Schiller's aesthetic treatises ("Über die tragische Kunst," "Über das Erhabene," "Über das Pathetische") on Lermontov's mature dramas A Masquerade and The Two Brothers.

In approaching the problem of Belinsky the situation was more difficult. It was perplexing to have to trace the critic's changing views of Schiller from youthful admiration through scornful rejection during his period of "reconciliation with reality" finally to self-identification with and idolization of the German poet. With his essays On Pushkin (1844) Belinsky established the reputation and the great influence of Schiller in Russia.

In the following Chapter I was able to reveal the influence of Schiller's Die Räuber on Bakunin's Catechism of a Revolutionist which is important as the first complete statement of a revolutionary point of view in Russian history.

Turning to Herzen and Ogarev I endeavored to show how their remarkable friendship developed and prospered under the auspices of Schiller's Don Carlos, how they identified themselves with some of the dramatic figures of Schiller (Karl Moor, Fiesco, Verrina, Posa, Tell) and how, guided by the ideals of Schiller, they dedicated their lives to the struggle for freedom and the welfare of humanity.

In the Chapter on Dostoyevsky I was able to demonstrate that Dostoyevsky's life and works are closely connected with Schiller and that he owes more to Schiller than to any other writer. Through an analysis of Dostoyevsky's principal works, including The Brothers Karamazov, I came to the conviction that they may be interpreted in a significant measure as reflections of his tenacious struggle with Schiller's aestheticism.

The last Chapter contains an account of Vyacheslav Ivanov's views of Schiller. Evaluating Ivanov's attempt to classify Schiller as a dithyrambic poet of mysticism I arrived at the conclusion that his interpretation is highly original and interesting but extreme, subjective, and arbitrary.

In the Conclusion I offer a bird's-eye-view of Schiller in Russia from V. Ivanov to the present time. Schiller's reception in the Soviet Union is briefly traced. Attempts by Soviet scholars to characterize Schiller as a champion of a classless society and a precursor of communism are defined as programmatic and ideological.

Microfilm $4.15; Xerox $14.65. 322 pages.

AN ANALYSIS OF THE CANTOS OF EZRA POUND

(Order No. 61-3132)

Arthur George Lennig, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Paul L. Wiley

Criticism which generalizes on The Cantos as a whole or comments only on selected parts tends to present an image coherent and unified but essentially unrepresentative of the poem's pecularities. In contrast, this dissertation analyzes each Canto from I through LXXI, and discusses in detail many Cantos--in particular, the Chinese and American History groups--for the first time. These individual analyses summarize main ideas, emphasize recurrent themes, explicate important passages, and identify linking devices. This method, supported by explanatory essays, reveals the individual character of the poem--its rather chaotic surface, its varied subject matter, and its aridities and repetitions as well as its best passages.

The introduction mentions various analytical methods and recommends the Canto by Canto procedure as a needed addition to scholarship. While the first chapter provides interpretations and insights by critics and a statement of Pound's intentions, it also examines the ideogrammic method, the use of foreign language, and other matters. The second chapter discusses themes and unifying devices, such as the archetypal hero, the process of metamorphosis, Homeric and Dantean parallels, various settings, Greek myths as thematic supports, and the relevance of Pound's political attitudes. His statements show that The Cantos is not purely aesthetic, but in the American reforming tradition in its protests against the misuse of money. After these suggestions for viewing the poem, chapters three, four, five, and six consist of Canto by Canto analyses divided into major groups and prefaced by explanatory essays.

The poem proves not to be as chaotic as it seems; for although passages are not conventionally or logically related, they are unified by certain basic themes. Although the major theme has been variously defined as the process of metamorphosis, the myth of Odysseus, and Pound as hero, the basic idea appears to be the opposition of fertility and sterility. This contrast is illustrated by Greek myths, historical and contemporary facts, and Poundian heroes. Whereas the states of fertility and sterility are related to Dante's Inferno, Purgatorio, and Paradiso, they are structured not consecutively but simultaneously. Thus the poem, despite common opinion, does not progress or develop but merely extends its frame of reference. A didactic work, its main judgments and attitudes were stated explicitly from its very beginning and do not appreciably change. Although the poem will someday end, no concluding passage could, it seems, seriously modify its basic themes.

Although The Cantos is controlled by theme and not subject, Pound attempts to unify the disparate elements through linking devices. Some are effective but most are too mechanical, obscure, and arbitrary to create sufficient form. Unfortunately, in his desire to be specific and concrete, Pound has made his allusions so obscure that they lead away from the poem and halt and perplex rather than enlighten the reader.

Although for the purpose of analysis, this dissertation examines The Cantos for the positive values of its ideas,

devices, and insights, the conclusion regards the subject matter as too broad, too thematically vague and the poem itself too long and too uncontrolled to be entirely successful. But even though the relationships between sections of individual Cantos are frequently confusing and obscure, the poem, when seen in perspective, is essentially explicit and clear. Moreover, because of its use of the ideogram, its original form, bizarre but interesting insights, and occasionally brilliant poetry, The Cantos can not be summarily dismissed.

Microfilm $5.80; Xerox $20.75. 456 pages.

JAMES BRIDIE: CLOWN AND PHILOSOPHER.

(Order No. 61-3533)

Helen Louise Luyben, Ph.D.
University of Pennsylvania, 1961

Supervisor: Gerald Weales

This critical analysis of twelve of the plays of James Bridie, the pen name of Osborne Henry Mavor (1888-1951), is selective rather than inclusive, since its intention is to illustrate a philosophical continuity throughout Bridie's work which when recognized goes far toward defining his total genius. The philosophical continuity is traced through three stages of moral awareness, which might be labeled innocence, disillusionment, and resolution, corresponding to three chronological periods, the early plays (1928-1937), the middle plays (1938-1947), and the late plays (1948-1951). The study attempts to show that Bridie is a moralist and that his plays, are in a special sense, morality plays; thus his original use of religious myth is explored, primarily his use of the myth of the fall from innocence (which includes the myth of temptation). In Chapter II, "Ambiguity in The Switchback," Bridie's first play is discussed as it uses the myth of Adam's temptation and fall to tell the story of a Scottish physician's struggle to meet both self and social responsibilities. In Chapter III, four plays (Tobias and the Angel, The Girl Who Did Not Want to Go to Kuala Lumpur, Marriage Is No Joke, and The Black Eye) are discussed as tales of innocent Adams who remain oblivious of the daemons tempting them to leave their particular Gardens of Eden. The discussion of Tobias introduces Bridie's use of another biblical story, that of the prodigal son. The disillusionment and at times resolution of "experienced" Adams is studied in It Depends What You Mean, Dr. Angelus, Daphne Laureola, and Mr. Gillie; Bridie's last play, The Baikie Charivari, is discussed as the story of a modern-day Pontius Pilate jolted from the innocent security of a belief in rationality.

Moreover, the study defends Bridie as a craftsman, in an attempt to correct the misconception that he is a bungler. Misinterpretation of his intention in the plays has led to criticism of their structure, which is not diffuse, unmeditated, or slapdash, but instead carefully plotted. Evidence for this view is found principally in the conscious use of myth, supported by a metaphysical use of language, but also in the use of common structural techniques (for example, dramatic foreshadowing). As Bridie's morality goes beyond the limits of logic--it is the morality of the story of the prodigal son, which opens its arms to the sinner--so his structure disregards the limitations of realistic drama, demanding dramatic forms--farce and fantasy--which will encompass the illogical and portray a higher reality than the realistic; so his language operates on two planes, literal and poetic.

Finally, Bridie's moral affinity with Shaw and Ibsen is explored, not with the intention of tracing literal borrowing but to clarify Bridie's philosophical and dramatic intention. The justification for such comparisons is obvious: Bridie wrote critically of Shaw as a playwright and adapted several of Ibsen's plays. From the two, he adopted a dramatic method which capitalizes on the use of what he called a judicial attitude, and a corresponding philosophical relativism, both of which allow the apparently irreconcilable conflicts in his plays between order and disorder, humility and pride, responsibility and irresponsibility, selflessness and selfishness, salvation and damnation. Shaw's influence is stressed in the earlier plays, Ibsen's in the later, when a greater moral awareness in Bridie's protagonists suggests their understanding of the relativity of human values as distinguished from the ambiguity of divine.

Microfilm $2.75; Xerox $8.40. 181 pages.

A. E. COPPARD: A CRITICAL STUDY OF HIS SHORT STORIES.

(Order No. 61-3534)

Russell Charles MacDonald, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Edwin C. Bolles

This study is concerned primarily with surveying and analyzing the fiction of A. E. Coppard, necessarily considering some relevant biographical data, Coppard's literary opinions, the historical context of his work, and an assessment of his achievements. Chapter One deals briefly with his family, his education, his reading, and his own memories of his youth, of the errand-boy, apprentice years, of the beginnings of his literary ambitions, of the growing discontent and final rejection of the work-a-day world, and the full commitment to a literary career. Chapter Two considers the general tenor of his fiction against the background of its times and brings together for consideration Coppard's ideas and attitudes about literature. Coppard was at once interested in the folk tale tradition, in storytelling at its simplest, and in the highly conscious artistry of Henry James, and the modern concern with organic form. These divergent influences shed much light on Coppard's work and, taken together with his judgments and tastes recorded in book review for several British periodicals, offer important insights into his fiction. Chapter Three deals with his early stories, the five volumes that appeared from 1921 to 1926, identifies the major themes and discusses Coppard's practices in language, in construction, in characterization, and so forth. The analyses were directed at the stories as stories, at the effects the author achieves and how he achieves them. By considering the work chronologically, we note Coppard's early command over technical problems and his rapid maturing as an artist. Some attention is given the critical and public

response to each of the volumes. Chapter Four continues the survey through the later stories. The characteristic practices of the author having been established, we note only the marked departures in the author's habits, and we concentrate the discussion on the strengths and weaknesses of the work. The final chapter deals with Coppard's quite uneven literary reputation, considers his achievements against the background of the British short story, and offers an estimate of his contributions.

Coppard was in the main stream of British romanticism. The world he wrote of was a modern world only incidentally reflecting little of the tempo and tension of the twentieth century. Wars, political upheavals, economic depressions – such events did not interest him as a writer, and understanding the age that Coppard lived in is of little help in understanding the world he wrote about. Coppard's great concern was with character, and his chief themes deal with man's relation to man, with the life that is lived day by day in English towns and country. We find much less distance between Coppard and Wordsworth than between Coppard and T. S. Eliot. But if a thorough traditionalist in content, Coppard was thoroughly modern in his understanding of tne short story as a form. Like de Maupassant, Coppard was fundamentally a popular writer, "a born storyteller," but as Flaubert helped make de Maupassant more than that, so the work of Henry James inspired Coppard to aim at a new synthesis of old interests and new diciplines. Coppard's best work holds up well under a close reading. We find him an excellent technician and find that he had – unquestionably – the vision of an artist. His fall from considerable critical acclaim in the twenties to almost total neglect today has been chiefly and simply the result of his having written too much, of having run out of things to say long before his career was over. His is a case of a writer whose gifts were quite literally exhausted by his energy and ambition.

Microfilm $4.00; Xerox $14.20. 311 pages.

BOOK TO A MOTHER: AN EDITION WITH COMMENTARY.

(Order No. Mic 61-1575)

Reverend Adrian James McCarthy, S.M., Ph.D.
Fordham University, 1961

Mentor: Gabriel M. Liegey

The Book to a Mother is a late fourteenth century devotional treatise in which a close imitation of Christ is proposed as the means of reforming the abuses found among Christians of both the religious and the lay states. As a prose work written for the laity by a priest who seems to have been a contemporary of Wyclif, the Book witnesses not only to the revival of religious prose in English, but also to the concern, among the faithful clergy, for the return of the Christian life to its evangelical principles.

The present work is a critical edition of the Book based on three extant manuscripts: Ms Bodley 416, Ms Bodleian Laud Miscellaneous 210, and Ms British Museum Additional 30897. These are referred to, respectively, as B L, and M. A fourth manuscript, a fragment containing about one-fifth of the complete text, was listed, in 1841, as No. 219 in the private collection of J. O. Halliwell-Phillipps, but since the dispersal of that collection in 1889, this fragment does not appear listed in identifiable form in the standard catalogues.

Because the three manuscripts used appeared to be copies, an attempt was made to discover, by collating them, a possible pattern of dependence. No consistent evidence of dependence appeared; however, a correction was noted in M which indicated a revision by the M scribe in favor of the B reading rather than that of L. The B text was favored for use as the basic one in this edition because of its relatively greater freedom from scribal errors, particularly such errors as could be discovered by consulting a known source for the passage in question. On this basis, B was judged the most trustworthy, M the least. Since the introductory pages of the Book are lacking in B, it was decided to use L for the basic text in this portion.

An analysis of the linguistic characteristics of the manuscripts revealed their common Midland origin, with Southwest Midland peculiarities appearing in B.

The Book gives no direct indication of the date of composition or of the author's identity. A solution to the problem of time was sought first in the allusions to current fashions in apparel; these pointed to the reign of Edward III (1327-77). The possibility of a veiled reference to Edward's last years, notorious for the influence exerted by his mistress, was seen in the author's complaint against the "Herods" who were sacrificing their kingdoms for "wicked women."

The author's reference to his "hearing of shrift" was seen as proof of his priesthood. In his belief in the "dominion of grace" theory, the possible influence of Oxford and two of its masters, Archbishop Fitzralph and Wyclif, was seen as a possibility. The author's use of the theory was judged free of the anti-ecclesiastical bent of Wyclif. The orthodox treatment of the Sacraments was noted, but traces of Predestinarianism were discovered, indicating the possible influence of Bradwardine, a pre-Wyclif proponent of the doctrine.

The "Mother" addressed throughout the Book was found to be sufficiently identified, by the author's detailed references, as actually his mother.

Scriptural and patristic sources were recorded. The extensive citations from Scripture, in English, were found to be independent of any known version, and to compare favorably, in style, with the "Wyclif-Purvey" texts. The thematic metaphor, that Christ is the Book for all men, was traced through Peter Lombard and Bonaventure, and found in the medieval "Charters of Christ."

The style of the Book was seen as adequate and occasionally brilliant. The narrative power and the homely analogies were noted, as were the incidental uses of parallelism and alliteration in the manner of Rolle.

The editor considers the Book important as representative of orthodox religious prose in English, in the pre-Lollard period.

Microfilm $4.80; Xerox $16.90. 375 pages.

RHETORIC IN THE WORKS OF ORESTES BROWNSON

(Order No. Mic 61-1576)

Reverend Leonard James McCarthy, S.J., Ph.D.
Fordham University, 1961

Mentor: Professor Joseph O'Neill, S. J., Ph.D.

The tributes to Orestes Brownson as a prose stylist and as a formidable debater on the public platform have been many and continuous. Yet in spite of a revival of interest in Brownson's work that has seen the publication in recent years of several biographical and critical works, as well as many articles, there has been no study of Brownson's style as such, nor of the rhetorical means he adopted in specific circumstances, nor of the rhetorical background he inherited.

Brownson's knowledge of rhetoric came from his fast reading, his experience on the public platform, the examples of the best orators of the day, and the American rhetorical background. From 1730 until 1785, rhetorical theory in America began to be more and more concerned with criticism and literary taste, and the publication of the British rhetorics of Blair, Whately, and Campbell, together with the American rhetorics of Witherspoon, Adams, and Channing, gave impetus to this trend. These texts largely ignored delivery, and the stage was set for the coupling of rhetoric with written composition, and for the establishment of elocution as separate discipline. These two notions of rhetoric, one as written composition, the other as elocution, reached the Civil War without their supremacy being challenged.

This is the rhetorical background Brownson inherited. Rhetoric for him was any discourse, spoken or written, that had for its end the winning of assent to a belief or an opinion, or the motivating of the will to some proposed action. Brownson's work falls into three rhetorical styles: the logical, the poetic, and the philosophical.

Brownson's major style was the logical one, and his two long essays on "The Laboring Classes" were his most sustained use of it. In these essays, he used argument, that is, he was intent on winning the reader's assent. He used all the traditional proofs of argumentation: induction, deduction, analogy and refutation. In the second essay he used all the forms of refutation: the direct ones of denial, distinction, and retort; the indirect ones of argumentum ad hominem, and reductio ad absurdum. Clarity and vigor characterized Brownson's logical style, and the logical style is the style he used most frequently in the collected works.

Brownson's The American Republic is written in the philosophical style. It is more carefully written than any of his other works, and is removed from the heat of controversy; the tone and texture of The American Republic is serene, objective, and universal. The characteristics of this style are: general utterances; aphoristic sayings; the maintaining of interest by variety of sentence structure; the enlivening of abstract diction by personification, and the use of rhetorical questions both for interest and transitions. In The American Republic, Brownson wrote a studious work inquiring into the nature and origin of government.

Brownson's poetic style is best seen in his many essays on Emerson. The use of imagery in Brownson is frequently a sign of a sharp rise in his emotions, and his criticisms of Emerson are pervaded with imagery. He uses all the figures of resemblance; simile, metaphor, personification and allegory, as well as the figures of contrast: contrast, irony and paradox. For the most part Brownson's imagery is conventional and literary. It is more the emotional appeal rather than any great imaginative power that gives these essays on Emerson their peculiar effectiveness.

Of the three styles discussed in this dissertation, the principle style of the collected works is the logical one. This is what one would expect, since the major part of his career was spent in argumentation and controversy. But a careful study of the collected works shows that there are many more emotional and imaginative elements in these volumes than had been thought. Indeed, Brownson's early style was a lyric one.

Brownson's style is a rich and complex one. It is the style of a rhetorician who was a master of searching irony which hardly ever became sarcasm, who used all the means of persuasion in specific circumstances, a master of metaphor who at the same time could put difficult and complex ideas into admirably lucid form.

Microfilm $3.60; Xerox $12.60. 279 pages.

SAMUEL JOHNSON AND THE HOSTILE PRESS

(Order No. 61-3454)

Helen Louise McGuffie, Ph.D.
Columbia University, 1961

For the last thirty-five years of his life, Samuel Johnson was the target of attacks from all quarters of the press. The criticism, which Johnson regarded as evidence of his fame, and which he refused to answer publicly, ranged in length from an epigram to an entire book, and in tone from scurrility to mild disapproval. Boswell and other Johnsonians give some information about these attacks, but the present study is the first exhaustive investigation of them. Based upon an examination of hundreds of periodicals and dozens of pamphlets, it is limited to attacks published during Johnson's lifetime. A chronological list of attacks is included as an appendix.

Beginning in 1749, with two pamphlet attacks on Irene, hostile criticism of Johnson increased gradually, reaching its greatest intensity in 1775. During the sixties, the increase may be attributed to the work of Charles Churchill, John Wilkes, William Kenrick, and Archibald Campbell. By criticizing Johnson's personality, character, politics, critical and scholarly work, and prose style, these four marked out lines of attack that later anti-Johnsonians followed, with little deviation, until 1784.

Of all aspects of Johnson's work, his style was attacked for the longest period of time. Directed at his latinized diction and balanced sentence structure, and appearing chiefly in periodicals, the criticism took two principal forms: burlesque and direct statement. Much of it was written by enemies who hoped to discredit Johnson or his works by mocking or denouncing his style; some, however, came from readers who admired Johnson, but disapproved of his stylistic idiosyncrasies.

Johnson's critics also attacked individual books. The Dictionary was ridiculed for its complex and allegedly prejudiced definitions, its inclusion of some words and omission of others, and its inaccuracies. Practically none of the criticism was serious or professional; like many critics of Johnson's style, those who attacked the Dictionary did so in an effort to denigrate Johnson.

In contrast to the criticism of Johnson's style and the Dictionary, which extended throughout his career, attacks on his edition of Shakespeare occurred almost entirely within the year following its publication. Most of the critics were scholarly and impersonal, but William Kenrick, in two pamphlets and a number of periodicals, vilified Johnson as well as his work. Kenrick's hostility, which continued for many years, led several admirers of Johnson to retaliate. At no other time was Johnson so vigorously defended in the press.

Johnson's four political pamphlets and the Journey to the Western Islands were attacked more furiously than any of his other works. Inspired by party zeal or national pride, his political and Scottish enemies, who wrote almost two dozen answering pamphlets and hundreds of briefer attacks in periodicals, continued to attack each book long after it was published. While a few critics argued seriously and fairly, the majority deliberately misinterpreted Johnson's meaning, defamed his character, and denounced him as a pensioned propagandist or an enemy of Scotland.

Criticism of the Lives of the Poets was remarkably different, most of it coming from professional men of letters who objected to Johnson's biographical methods or literary judgments. Admirers of Milton and Gray were particularly indignant, and produced five of the seven pamphlets written in answer to the Lives. But except for James Thomson Callender, who published two savage anti-Johnson books in 1782 and 1783, Johnson's critics after 1779 were generally reasonable and restrained, concentrating upon his work rather than his personality, and expressing their disapproval in dignified terms.

Microfilm $5.55; Xerox $19.80. 436 pages.

LE BESTIAIRE DE PIERRE DE BEAUVAIS
[French Text.]

(Order No. 61-3540)

Guy René Mermier, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. William Roach

This dissertation presents a study of Pierre de Beauvais' French prose Bestiary, it attempts to throw a better light on Pierre's personality, and to evaluate his contribution to medieval literature.

We examine first the Physiologus, the oldest ancestor of the bestiaries. We establish that it was composed in Alexandria during the second century of our era, but that its author is unknown. Although doubts still veil many aspects of the original and lost Physiologus, we show that its influence upon classical and medieval literature was immense. We also point out that the Physiologus was soon translated from Greek into Latin and gradually into almost all Near Eastern and European languages. The best editions available of the Greek and Latin texts are mentioned, the latter being studied with particular attention since it is from the Latin Physiologus that all the French bestiaries were translated. We note that the contents of the Latin translations of the Physiologus were gradually increased and that this interpolated Latin Physiologus was adopted as authentic by the French translators.

After having established the degree of evolution of the Latin Physiologus tradition, we examine the French bestiaries. In presenting the bestiaries of Philippe of Thaün, of Guillaume le Clerc and of Gervaise, we bring up to date the most important critical elements concerning their history and nature. The following pages being dedicated to Pierre de Beauvais, we mention him only briefly in this section.

Chapter one deals with the modifications made to the Physiologus tradition up to Pierre de Beauvais. It makes us appreciate the background of Pierre's Bestiary. This appraisal is important since this work represents both the continuation and the extinction in French of the moralised Physiologus.

In the second chapter we examine the personality of Pierre de Beauvais; we bring up to date the historical and critical factors concerning Pierre's life and his works. A brief summary of contents of the latter brings out the two poles of Pierre's preoccupations: one centered around works of religious inspiration and the other around purely didactic works.

The third chapter offers a close study of Pierre's Bestiary proper. We compare his Bestiary with the Latin version Reg. 2Cxii of the B-Is. type and we divide the seventy-two articles of the Bestiary into four different categories: the articles which are exact translations of the Latin, those showing a few minor additions or omissions, those with important omissions or additions, and all the articles which have no correspondence in Latin. Such a division brings to light the original contribution of Pierre to the evolution of the Physiologus in its French branch.

Finally we make a synthesis of the different conclusions reached in this dissertation. We find that Pierre's works present a fundamental unity of form and content, based upon didactic, moral and theological inspiration. We show that Pierre had an independent and curious mind dedicated to bringing lessons of the Physiologus to the understanding of the lay people. Hoping to have lifted the veil of obscurity which was hiding the true stature of this medieval Picard poet, Pierre de Beauvais, we mark the great importance of his Bestiary at the end of the French ramification of the Alexandrian Physiologus.

Microfilm $2.75; Xerox $7.40. 156 pages.

VICTOR HENRI DUCANGE: A PARTICIPANT IN FRENCH RESTORATION LIFE AND ITS INTERPRETER.

(Order No. 61-3372)

Lucian Weld Minor, Ph.D.
Boston University Graduate School, 1961

Major Professor: André Célières

A fundamental dichotomy characterized the French Restoration which found expression in social relationships, political life and in literature.

France was governed by a monarchy supported by a militant oligarchy of powerful and wealthy men. This oligarchy of royalists and "liberals" influenced the king and controlled the parliament. Neither was democratic.

Literature faithfully reflected the points of view of the oligarchy. Early French Romanticism was encouraged and supported by the royalist government. Scott became immensely popular not only through his talents but because he portrayed the Christian, feudal, and gothic past which the Bourbon government wished to popularize.

The huge remainder of France was excluded, had no voice in its own destiny; its wishes and pleasures were little known. Nonetheless it had a flourishing literature: the known but disregarded melodrama and the popular novel.

These popular forms began in the last years of the eighteenth century, developed popularity and by the 1830's were strong enough to work a decisive influence upon their respectable counterparts. Victor Ducange was one of the early writers of melodrama. When gifted, educated men took up the melodrama, it blended dominantly to produce a new kind of theater.

The cabinets de lecture furnish astonishing information about the huge success of the popular novel. It developed in two strains: the roman noir popularized by Ducray-Duminil used English gothic techniques to win popularity, while the roman gai began with Restif de la Bretonne and Pigault-Lebrun and told middle class love stories in light-hearted fashion. Victor Ducange was equally successful in this genre.

The novels are of interest because they allow an estimate of the genre in this stage of its development, and an assessment of the aspirations, fears, and resentment of the majority. Their point of view was seldom upheld by the better known authors.

Ducange's novels, published between 1819 and 1835, are unvaryingly love stories set firmly in a middle class milieu, showing ordinary lives. The obstacle is one of religious differences, parental social ambitions or financial schemings. These allow the author to place the stylized lovers in a situation he finds worthy of criticism. Both settings and issues are of contemporary interest.

From the novels is drawn the portrait of the Restoration complicated by the return of the royalist government, the émigrés and the Jesuits. The author paints a portrait of himself through his many entries into the novels. An educated, perceptive eye-witness of the time, he explains his era to us and serves, himself, as an example of it.

His novels, in which the noir and gai strains are mixed in order to make his social lesson vivid, are expositions whereby the audience is pleased and the lesson made graphic. Ducange's use of the middle class milieu foreshadows the realistic novel; his use of the novel in the cause of social and political justice precedes that of the realistic and naturalistic novel.

Both popular literatures reflect the life of the majority; both are weapons for social and political justice. They force acceptance by the mainstream of respectable literature just as the majority of France begins to force its own acceptance into the life of France.

Microfilm $4.25; Xerox $14.85. 329 pages.

THE GENTLEMAN'S NOVELIST: ROBERT PLUMER WARD (1765-1846).

(Order No. 61-3544)

Katharine Dealy Newman, Ph.D.
University of Pennsylvania, 1961

Supervisor: Morse Peckham

The fictional works of Robert Plumer Ward are part literature, part social documentation. Analysis of them demonstrates the continuance of late eighteenth-century ideas in the early nineteenth century, especially among the upper classes. Having risen, through patronage and his own abilities to important posts in government, Ward committed the "social heresy" of publishing a novel after he retired. This was Tremaine, the best-seller of 1825, partly because of the mystery of its authorship, but chiefly because of its authentic description of contemporary life. Ward, however, was not primarily interested in writing novels; his picture of the dandy, the "Man of Refinement," was written to persuade the upper classes to curb their post-Napoleonic war extravagances and return to country living, the simple life, and religion. One-third of Tremaine was devoted to a dialogue on the working of Providence which Ward attempted to develop without reference to the Christian revelation, using science, history, and reason as his basis. The respect evinced by his readers showed that there was much genuine interest in religion among orthodox as well as Evangelical members of the Church of England; only the Benthamites attacked its premises. Tremaine, as a piece of literature, is an excellent novel of manners with shrewdly motivated characterizations and great charm despite its heavy didacticism.

Ward's second book, De Vere (1827), profited by appearing just as George Canning was made prime minister, since he was Ward's model for an important character in this work which was intended to show politics as the serious excitement of the English gentleman, a game to be played for the highest stakes. De Vere is a pioneer in the political novel, as Tremaine was in the religious novel and the psychological romance. These books greatly influenced younger writers, particularly Disraeli and Bulwer.

The responsibilities of wealth and the tragic deaths of members of his family prevented Ward from writing from 1827 until 1837 when he published, under the title of Illustrations of Human Life, three "moral sketches," "Atticus," "St. Lawrence," and "Fielding," which was eighteenth century in style and spirit. In 1839, however, in Pictures of the World at Home and Abroad, he showed his realization of the danger to his class and, as a result of his anger, achieved his best integration of argument and plot.

"Penruddock" is a portrayal of a beleagured aristocrat, "Sterling" is a study of the disintegration of a declassed personality, and "The Enthusiasts" is a tragedy resulting from the inevitable momentum of revolutionary ideology--all new theses in the English novel. His last story, De Clifford, in 1841, was a very long love story, set in the days of his own youth, and characterized by more bustle and enjoyment of life than his earlier works, despite his theme, the impossibility of there being any happiness from a mésalliance.

Even in his own day Ward's reputation suffered from his aloofness from the literary scene and from his being a spokesman for the minority group, the Tory aristocracy, when the middle classes were rising in power and the great Victorian novelists emerging. A link between the Romantic and Victorian periods, Ward is also important in his own right as a subtle commentator of contemporary life and as a novelist, malgre lui.

Microfilm $5.10; Xerox $18.00. 399 pages.

JAMES THOMSON'S THE CITY OF DREADFUL NIGHT. A STUDY OF THE CULTURAL RESOURCES OF ITS AUTHOR AND A REAPPRAISAL OF THE POEM.

(Order No. 61-3898)

Henry Paolucci, Ph.D.
Columbia University, 1961

The aim of the dissertation is to encourage close study and reappraisal of the literary and philosophic significance of James Thomson's The City of Dreadful Night. The introductory chapter presents a brief description of the poem, indicating its imaginative dependence on the Divine Comedy and on the pessimistic thought and poetry of Giacomo Leopardi, and a review of the unresolved problems of literary criticism, underlying all of which is the question of the poet's cultural resources. The introduction is followed by a series of chapters examining evidences of the poet's religious, moral, literary, and philosophic preparation. The study concludes with a commentary on the poem, using the examined evidences of the poet's preparation to facilitate critical analysis of its content and form.

Of the resources he was able to draw upon in writing the City, Thomson has left an extensive record consisting of moral, critical, and philosophic essays, religious and social satires, translations, metrical imitations and experiments, most of them originally published in little-read secularist and trade journals. That record is examined in this dissertation not on the assumption that acquaintance with it is a prerequisite for appreciation of the poetic and intellectual significance of the poem, but rather in order to dispel some of the prevalent misconceptions about the poet's preparation--misconceptions that have made adequate appreciation difficult.

In his youth, Thomson wrote a long narrative poem, "The Doom of a City," which is obviously a preliminary draft of The City of Dreadful Night. Dissatisfied with his early treatment of the theme, he determined to perfect himself as a poet, refining his literary art, informing his intellect, purging his will, until, in his thirty-sixth year, he at last felt competent to write of his City of Melencolia with sufficient "knowledge and power to deal with the theme in its epic integrity." The course of this moral, literary, and philosophic self-discipline is traced in the second, third, and fourth chapters.

In Chapter V, after close examination of the text, the conclusion is drawn that the poem, as a finished work of art, reflects less what the author thought and felt in writing it than what the reader thinks and feels and brings to bear in reading it. If words can stir him, he will be struck by the force of Thomson's lines. He will not fail to "see" imaginatively that the poem represents the effects of a great loss of some kind. If he reads with a purely biographical interest, he will think that he sees evidences of poverty, insomnia, and alcoholism on every page. If he comes to it with a mind full of concern for nineteenth-century social and religious problems, he will trace in its stanzas the effects of the new geological, biological, and social sciences that call all things in doubt. If he takes Professor Gerould's advice and reads it "as Ecclesiastes or Aeschylus should be read . . . for purification through pity and fear," he will certainly get more out of it. Whatever his intellectual or moral disposition, he will find that the poem manages to expand in meaning as his interests expand.

According to Thomson's intention, however, there is -- the dissertation suggests finally-- a minimal requirement; the least one should bring to bear in attempting to read the poem intelligently is a fair acquaintance with the poetic world of Dante. For it is the loss or exhaustion of all the good things of that world --not a personal but an historical loss-- that is represented in The City of Dreadful Night.

Microfilm $4.15; Xerox $14.65. 321 pages.

THE YISHUV IN PALESTINE IN THE 19TH CENTURY AS REFLECTED IN ITS HEBREW LITERATURE.

[Hebrew Text.]

(Order No. Mic 61-2110)

Zvulun Ravid, D.H.L.
Yeshiva University, 1960

Summary: The early settlements in Palestine have been described from many different points of view. However, there is no research dealing with the Hebrew literature of this period written in Palestine itself as a reflection of the settlers' own comments on their experience. This study aims to fill this gap.

The following sources have been closely examined: the Libanon, the Hebrew newspaper that first appeared in 1863, the Habatzelet, first published half a year later, and Yehuda Ve-Yerushalayim, first published in 1870. In addition, secondary sources have been used for the social, economic and cultural background of the period. Among these the research of A. M. Luncz, J. Yellin, J. Sapir, the memoirs of distinguished visitors to Palestine, both Jews and Gentiles, e.g., the diaries of Moses and Lady Montefiore, and other publications.

The study shows beyond doubt that the Hebrew literature of Palestine in the 19th century, heretofore totally neglected, embodied the fundamental values of the revival

of the Jewish people in its historic homeland long before the Zionist movement came into being.

Microfilm $3.60; Xerox $12.60. 279 pages.

SOVIET HISTORICAL DRAMA: ITS ROLE IN THE DEVELOPMENT OF A NATIONAL MYTHOLOGY.

(Order No. 61-3466)

Spencer Eugene Roberts, Ph.D.
Columbia University, 1961

In primitive societies where myth is an ever-present force, it operates in various ways and with varying strengths at various times, but its full force is reached when man is confronted with an extraordinary and dangerous situation. Ernst Cassirer, who discusses this idea in The Myth of the State, adds that myth functions in much the same way in advanced stages of political life. The Soviet experience would seem to prove the validity of Cassirer's thesis. Intensely aware that myth is valuable if it prevents disintegration, decadence, or internal strife, Soviet playwrights have consciously tailored myths to serve the exigencies of the moment.

Historical drama first blossomed when the country was torn by civil war and intervention. Dramatists, seemingly of their own accord, turned to the past in order to convince wavering citizens that history was on their side. By demonstrating that numerous pre-Revolutionary liberals and rebels had fought for ideals identical with those of the Bolsheviks, they hoped to provide the new regime with respectable ancestors; simultaneously, they set out to prove that the Revolution was the product of steadily progressing, inexorable forces, not the spontaneous whim of a small group of power-crazed insurgents. The accompanying myths were designed to resolve all contradictions in the evidence and place the portrayed figures or events unequivocally on the side of truth.

With defeat of the White opposition and the country reunited, historical plays continued to appear, their myths now designed to expose the hypocrisy, corruption, and immorality of earlier Russian rulers and the aristocracy.

In the thirties, as German military preparations threatened the Soviets, historical dramas assumed a new importance. Now officially encouraged, dramatists employed myths to transform past Russian military leaders and statesmen--formerly regarded as mere lackeys of the Tsar--into self-denying patriots defending the State, but not the autocracy it contained.

When war finally came, all former restraint was abandoned, and writers mythologized their historical protagonists to such an extent that scholars--themselves guilty of manipulating the past--protested the liberties so freely taken.

The successful conclusion of hostilities did not, however, mean that danger had passed or that myth could be abandoned. During the war, Western influences had made their way into the country; Russians fighting abroad had witnessed a more advanced standard of living; discontent and distrust of Party infallibility called for counteraction; the new socialist and communist countries needed to be convinced of the superiority of Russian culture. In the campaign to justify Soviet pre-eminence among members of the communist bloc, playwrights mythologized tsarist writers, musicians, and scientists into dedicated leftists serving the masses.

By the time Khrushchev assumed power, the gravest danger had passed. As the country was deemed secure, myth could be dispensed with on the Soviet stage.

The dissertation, besides examining the literary and ideological controversies which arose over historical plays between 1917 and the present, also traces the evolution of the myths in them against the changing background of the theory of history. In three instances, each typical of a major stage through which historical drama passed, one particular play and its myths are analyzed in detail. What were the historical materials available to the dramatist at the time? What did he do with them in the way of selection, addition, and subtraction? Why did he do this? How much are his images out of focus with those of earlier historians or eyewitnesses? How much of the myth is still officially sanctioned? Such are the questions the investigation attempts to answer in its analysis of plays dealing primarily with Sten'ka Razin, Peter I, and Lermontov. Microfilm $4.90; Xerox $17.35. 382 pages.

THE FICTION OF LEONID LEONOV

(Order No. 61-3902)

Nathan Rosen, Ph.D.
Columbia University, 1961

Leonid Leonov is a major Soviet novelist, playwright and short story writer whose works reflect every phase of Soviet history from the Revolution to the post-Stalin period. In his early work Leonov was concerned primarily with problems of form. In a statement made in 1927 he insisted on the artist's autonomy and expressed his admiration for Dostoevsky. Later in the twenties Leonov became a propagandist for Communism and he now occupies a very prominent position in Soviet letters. Nevertheless he has produced many works of high quality which show a keen mind of marked individuality. His works also show a good deal of suppleness in meeting both the needs of his art and the ideological demands of his society. The dissertation is concerned chiefly with the problem of the demands made upon art by Soviet society as these are reflected in Leonov's novels.

Leonov's most impressionable years were spent in prerevolutionary Russia. The known facts of his childhood and youth are set forth and their significance for his work assessed. The most important of his early short stories are analyzed as experiments in prose and as expressions of a consistent and complex point of view on art and life. This provides the basis for an extensive discussion of each of Leonov's novels, taken in chronological order: The Badgers (1924), The Thief (1927), Sot' (1930), Skutarevsky (1932), Road to the Ocean (1935), The Taking of Velikoshumsk (1944), and The Russian Forest (1953). Each of these works is studied in relation to Leonov's previous works and against the background of Soviet history.

Leonov's assertion that all his works, taken together, constitute a "spiritual biography" is tested by examining the consistency and evolution of the themes, characters and

situations in his major works, with due consideration to his own statements and to the various pressures and influences upon him. Language and style are treated descriptively rather than analytically. The structure of each novel is examined intensively at key points which clarify our understanding of the work.

The dissertation spans chronologically Leonov's entire career as a writer from 1922 to 1953. This wide range and the detailed analyses of individual works, set against the social and intellectual background and seen in relation to Leonov's previous works--all this, it is hoped, will contribute to an understanding of the way a Soviet writer functions in his society: having accepted the basic premises of that society, how he survives its pressures, at what cost to his art, and what elements of genuine artistic achievement are to be found in his work.

Microfilm $3.55; Xerox $12.60. 276 pages.

SHAKESPEARE'S USE OF OFF-STAGE SOUNDS

(Order No. 61-3834)

Frances Ann Shirley, Ph.D.
Bryn Mawr College, 1960

Shakespeare and his contemporaries were able to rely on a wide range of off-stage sounds to help heighten illusion, create suspense, and produce other dramatic effects in their plays. The first chapter of this dissertation is devoted to a continuation of W. J. Lawrence's investigation of the equipment available -- cannon, bells, thunder machines and other paraphernalia -- for producing the sounds in the theatre. Hand in hand with actual mechanical methods go the problems of location of equipment and means of cueing the people who worked the machinery.

The second chapter contains some observations on the care with which stage directions for sounds were included in the First Folio and early Quarto texts. The plays in which the sounds are most important -- the tragedies -- as a general rule have the more carefully preserved stage directions. One often feels that the Folio texts, when they vary from the Quarto texts and seem to have been based on playhouse copies, may show the results of Elizabethan staging practices. The "bad quartos" provide some interesting comparisons, although they have little information of value about the off-stage sounds.

After this preliminary study, with its attempts to make plain that the Elizabethan audience could indeed have heard the sounds, and its efforts to see how important the stage directions were to those who first copied and printed the plays, it is natural to turn to a general consideration of the uses of off-stage sound. Four classifications have been made: Warfare and Military Life, Fanfare and Pageantry, Time, and The Supernatural. An attempt has been made to show the full range of effect Shakespeare could achieve with the sounds that fall under the various headings. The flourish of a trumpet, for example, would certainly help to create an atmosphere of pageantry. It could also create excitement or suspense, or, if used for someone the audience knew would soon be toppled from high position, an air of pathos or irony. And it could, in some instances, reveal the hitherto hidden states of mind of those on stage who heard it.

The fullest appreciation of Shakespeare's command comes when one studies his use of off-stage sound as a part of the entire structure of a play. There are three tragedies, Julius Caesar, Hamlet, and Macbeth, that lend themselves especially well to this sort of study. The sounds are important, the old texts have carefully preserved stage directions, and there are few thorny textual problems that stand in the way of a person interested primarily in the sounds.

There are, at the end of the dissertation, two sections that may prove useful to those interested in staging and in theatre history. The first is a catalogue of the stage directions found in the old texts, with additional sounds noted when the dialogue or, occasionally, custom would seem to warrant them. There is no attempt to determine whether these stage directions are Shakespeare's or merely the work of those who copied or printed the early texts. But the list at least shows what the old texts and dialogue demand of those who stage the plays. The second section, appearing as a part of the Bibliography, is a catalogue of the promptbooks and acting copies of Shakespeare's plays that are to be found in the Enthoven and Dyce and Forster collections of the Victoria and Albert Museum, and in the Shakespeare Memorial Theatre Library at Stratford-upon-Avon. Microfilm $3.35; Xerox $11.70. 257 pages.

THE TRANSLATION OF THE NEW TESTAMENT INTO ENGLISH, 1881-1950: STUDIES IN LANGUAGE AND STYLE.

(Order No. 61-3556)

John Hamilton Skilton, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor Allan G. Chester

This study attempts to set forth traits of the language and style of English versions of the New Testament which have been published since 1881. The versions which have been given chief attention were all published before 1950, but brief notice has been taken of certain translations which have appeared after that date.

A Working Bibliography, at the beginning of the dissertation, lists more than 500 new or revised translations of the New Testament in its entirety or in part into English which have been published between 1881 and 1961. Attention is called to titles in this Bibliography and to statements made by translators which evidence two prominent and not unrelated interests: the first, in translating the New Testament into an up-to-date English, at times into a plain, everyday grade of language intelligible to all; and the second, in revising the Authorized or some other version.

Various aspects of language and style are touched upon in a sampling of the renderings of a large number of translations. One thing which seems to be indicated in this phase of the study is that there has been a marked, although not universal, avoidance of the archaic and an employment of contemporary usage in vocabulary and forms. The

investigation then proceeds to a more intensive evaluation of sixteen representative works. To a degree, it is found, the objectives expressed by the translators have been realized, but numerous defects of style are also discovered.

The next phase of the study is a comparison of twenty-one versions (including the Authorized Version, the English Revised and the American Revised versions, a form of the Rheims-Challoner Version, and the sixteen representative works mentioned above) in their treatment of fifteen selected passages. Attention is given to such matters as relative terseness, length of words used, the correlation between the total number of words used and the number of longer words employed, the influence of the subject matter and style of the original on the frequency of the translators' use of longer words, simplicity of diction, origin of words, and recurrence of words. A conspicuous recurrence of words used in the Authorized Version is noticed in the versions of our period.

It is concluded that knowledge of the magnitude, variety, and character of the translation work which has been done since 1881 should discourage rough generalizations and should prompt treatments of that work which are not limited to a consideration of a few of the better known versions. The stylistic aims of the translators of our period, although held to be often attained, are judged not to be as fully realized as might have been expected. Specific points of instruction and warning for translators are drawn from the accomplishments and the deficiencies of the versions which have been studied. It is maintained, among other things, that future translators should seek to benefit from the work of their predecessors, not only from the work which has been done since 1881, but also from that of an earlier day. Microfilm $11.40; Xerox $40.70. 904 pages.

THE DRAMATIC METHOD OF HARLEY GRANVILLE BARKER

(Order No. 61-3557)

Elizabeth Joan Smithers, Ph.D.
University of Pennsylvania, 1961

Supervisor: Gerald Weales

The plays of Harley Granville Barker have been overshadowed not only by the plays of George Bernard Shaw, but also by Barker's own reputation as a master of Shakespeare criticism. Writers on the British drama never fail to list Barker as an important playwright of the twentieth century, but they devote little critical attention to the plays, dismissing them as plotless "intellectual" dramas patterned after those of Shaw, adding always, however, that Barker's place in the history of the theatre will be secured by his near-genius as a director and critic of Shaw and Shakespeare. Both Barker's criticism and his theories of drama are useful in any attempt to define the uniqueness of Barker's plays. For the plays are unique, quite unlike the plays of his British contemporaries, and a part of the difference can be accounted for by Barker's innovations in stage diction. The speech of his characters is dictated, not by the logic of the well-made play, which imposes unity from without, but by the larger unities of mood and theme which grow from within. An examination of Barker's full-length plays--THE MARRYING OF ANN LEETE, THE VOYSEY INHERITANCE, WASTE, THE MADRAS HOUSE, THE SECRET LIFE, and HIS MAJESTY--reveals that the search for meaning in which Barker's characters are engaged is a dialectical process, out of which grows the structure of his plays. At the center of each play's design stands the leading character; around him are grouped all the other characters, reflecting various attitudes toward the play's central theme. Barker is scrupulously fair to each of his characters, and each of them is given ample opportunity to state his case--or to reveal his attitude, for no attitude in a Barker play goes unopposed. For that reason, his leading characters--Ann Leete, Edward Voysey, Henry Trebell, Philip Madras, Edward Strowde, Henry XIII--often seem to be weak. In each of them, however, there are elements of revolt and a strongly developed sense of responsibility; in their attempts to define their own attitudes they create the tension, interplay, and dialectic of the plays.

Barker has for too long been erroneously classed with Galsworthy as a writer of topical thesis-plays or dismissed as a pale reflection of Shaw. He was a European playwright, in the larger sense of the term, and his real affinities are with Ibsen, with Schnitzler, and with Chekhov. He developed independently of Chekhov; what he took from Ibsen and Schnitzler he remolded to suit his own habits of mind and his own dramatic method, a method unique among the Edwardian playwrights, and one which made him a master dramatist of a very high order.

Microfilm $2.90; Xerox $10.15. 223 pages.

COHERENTS FOR THE TIME: IMAGERY IN THE COMEDIES OF GEORGE CHAPMAN.

(Order No. 61-3412)

Richard Stanton Sprague, Ph.D.
Boston University Graduate School, 1961

Major Professor: Albert M. Gilman

The purpose of this study is to examine the imagery and relationships between imagery and structure in the eight comedies that George Chapman wrote without collaboration. In the first chapter several underlying assumptions are set forth. These concern the appropriateness of formal criticism, the critical neglect of Chapman's adherence in comedy to philosophical as well as artistic decorum, and the significance of his expressed intention of creating ethical "coherents" for his age. The functions of dramatic imagery are classified, and Chapman's awareness of irony and decorum is indicated by his commentaries on Homeric translations and his early non-dramatic poems. Finally, the usefulness of the commonplace symbolism of Fortune as an index to Chapman's ethical thought and comic structure is advanced in connection with his intellectual inheritance and moral predispositions.

The Blind Beggar of Alexandria is shown to belie its apparent merely farcical content by Chapman's consistently ironic manipulation of imagery of the process of knowing.

An Humourous Day's Mirth displays inventiveness not only in its humour characters but in its adaptation of the hoary Fortune tradition to the comic stage. It also achieves

considerable unity through imagery which binds together the successive appearances of the humour characters and ironically deflates the language of Stoicism.

In All Fools Chapman synthesizes the many actions by playing off imagery of agricultural husbandry against imagery of matrimonial husbandry, and allusions to animals and Fortune maintain the theme of the struggle to achieve self-hood.

Sir Giles Goosecap bears accurate witness to the philosophical and ethical sympathies of Chapman only if Clarence, the melancholy scholar, is regarded in the light of the imagery of health and disease which interanimates the romantic and realistic plots and thereby exposes the irrationality of Chapman's supposed ethical spokesman.

In May-Day animal metaphors create an atmosphere of debased human life in which a complicated set of gullings illustrates the foibles of sexual opportunism.

The Gentleman Usher sees the realistic plot paralleled with the divided romantic plot by the ironical indirection of patterns of imagery which they share in common. Love in courtship and marriage is elevated against a background of a hunting expedition. Chapman's highly characteristic structural linkage of themes and plots by literal and figurative language is fully evident in this comedy.

In Monsieur D'Olive imagery of burial, music, circles, light, and darkness creates a poetically and thematically coherent romantic comedy in which an ethical transformation expresses Chapman's concern with rational love and marriage.

The Widow's Tears, Chapman's last comedy, possesses very full imagery and technical diction of law and logic. Examination of the dialectical progression of this dramatic language demonstrates that, contrary to received judgment, The Widow's Tears is not cynical in its point of view but sustains the ethical burden of Chapman's earlier plays and poems. Presented before the elite audience of professional men of the Blackfriars theater, the play, which is in effect a dramatized controversy, satirizes the popular and legal disparagement of the remarriage of widows.

Collectively, the images in Chapman's comedies reveal ironic force and ethical and structural coherence.

Microfilm $4.30; Xerox $15.10. 335 pages.

POULLAIN DE LA BARRE: A SEVENTEENTH-CENTURY FEMINIST.

(Order No. 61-3908)

Marie Louise Stock, Ph.D.
Columbia University, 1961

François Poullain de La Barre (1647-1723) is best known as a feminist. At a time when writers were still advancing arguments, current since the Middle Ages, to prove woman's superiority or inferiority, he expressed ideas whose originality has won him a place in histories of the feminist movement.

In this dissertation, the account of Poullain's life is based to a considerable extent on documents in archives in Paris, Laon (he served as a priest in this diocese from 1680 until his conversion to Protestantism in 1688), and Geneva, where he ultimately taught in the Collège de Genève. Other sources used are dictionaries of biography and Poullain's works. Included in the biography is an analysis of his six published books: Les Rapports de la langue latine à la françoise pour traduire elegamment et sans peine (1672), a students' manual of helpful hints on translation; De l'égalité des deux sexes (1673); De l'éducation des dames (1674); De l'excellence des hommes (1675), a feminist treatise in spite of its title; Essai des remarques particulières sur la langue françoise pour la ville de Genève (1691); La Doctrine des Protestans (1720), an attempt to find justification in the missal for the four points of Protestant doctrine which he considers the chief source of disagreement between Protestants and Roman Catholics.

The major portion of the dissertation is devoted to a study of Poullain's feminism. He approaches the problem as a Cartesian, rejecting tradition and insisting on a rational examination of the question. From a comparison of the two sexes from the physical, mental, and moral standpoint, he deduces that women are men's equals. He considers the nature of the various branches of learning and the qualities necessary to carry on a profession, and concludes that women have the ability to engage in any field of study or profession and occupy positions of authority. If they enjoyed the same educational advantages as men, there would no longer be any question of their inferiority. It is their right and duty to develop their intellectual potentialities. For their guidance, he outlines a course of study in which the influence of Descartes is preponderant.

An examination of representative feminist works written in France in the century after the publication of De l'égalité des deux sexes shows that Poullain's treatises produced no immediate reaction, but that after the publication of the editions of 1690, and as late as 1753, his ideas were repeated by other writers on the subject. De l'égalité des deux sexes was translated into English in 1677; articles based on this work appeared in the Gentleman's Journal in 1692 and in the Lady's Journal in 1693.

Poullain's preoccupation with social questions is not limited to the status of women. Scattered through his books are ideas which mark him as a precursor of the liberal thinkers of the Enlightenment. He posits the natural equality of all human beings, advances theories about the origin of civil society, suggests that the development of the arts and sciences has not contributed to human happiness, shows disapproval of the social injustices of his day, condemns prejudice and tyranny of every kind. A study of his works provides evidence that ideas considered revolutionary in the next century were being expressed in 1675.

Microfilm $3.45; Xerox $11.95. 265 pages.

THE PORTRAYAL OF FRENCH MANNERS IN LE DIABLE BOITEUX AND GIL BLAS OF ALAIN-RENE LESAGE

(Order No. Mic 61-1585)

Anthony F. Taras, Ph.D.
Fordham University, 1961

Mentor: Fernand Vial, Ph.D.

While the popularity of Le diable boiteux (1707;1726) and Histoire de Gil Blas de Santillane (1715;1724;1735) has never been challenged, their provenance has been a source of contention and dispute among scholars ever since their

publication. Since the Gil Blas question continued for a long time to occupy the interest of scholars, no serious investigation was made concerning the supposed literary larcenies in Le diable boiteux until Jean Vic's study, "La composition et les sources du Diable boiteux de Lesage," (1920). Vic arrived at the conclusion that approximately five-sevenths of the definitive edition of Lesage's novel is Spanish-inspired, and that the remaining portion contains definite allusions to the living manners in France. In his "Le diable boiteux (Lesage)--El diablo cojuelo (Guevara)," (1935), Hermann Willers made a detailed comparative study of the various imitations and adaptations of the Spanish sources indicated by Vic. Willers concluded that despite its Spanish background, Lesage's novel presents a reliable portrait of the manners and customs of his times. In the case of Gil Blas, the literary integrity of Lesage deserved a more thorough study beyond the vacuity of theories presented by some disputants. A laudable attempt to discover the sources used in Gil Blas was made by Gustav Haack in 1896. In his Untersuchungen zur Quellenkunde von Lesage's Gil Blas de Santillane, Haack concluded that, in spite of the many adaptations in Gil Blas, more than half of Lesage's novel is the author's alone.

In view of the research conducted by Vic, Willers and Haack, there still remained an investigation into the numerous references and allusions to contemporary France which are found in Le diable boiteux and Gil Blas. That such references and allusions do exist is attested by contemporary reviews of both novels. This evidence would appear to corroborate the expressed intention of Lesage who tells his readers the objectives of both novels, namely, to re-present the life of his times. It is precisely the consideration of that portrayal with which this study is concerned.

Through the use of a Spanish backdrop and fictional characters to disguise his criticism somewhat, Lesage's novels offer an excellent insight into the customs and practises of eighteenth-century society in France. In depicting these activities, Lesage succeeds in both novels in weaving, as it were, the manners and customs of the period into a pictorial fabric at one varied and vivid. The portrait which Lesage reveals has been pieced together in the following manner: the political practises and functionaries of the State; various aspects of French society with emphasis on the moeurs of the nobility, the clergy and the bourgeoisie; writers and their milieu; actors and actresses; doctors and their medical treatments; and miscellaneous allusions and personnages à clef.

The authenticity of the numerous traits de moeurs which form the substance of both novels is attested by a convergence of historical witnesses and memorialists, who give substantially the same testimony as Lesage, and not infrequently, relate with many precise details the very events witnessed by Don Cléophas and Gil Blas.

Although this study may not have treated every detail in both novels--a task rendered difficult and at times fruitless for the lack of adequate or reliable information which might have helped to elucidate certain allusions in the novels--it has shown two things: first, that the novels present a portrait of the moeurs of French society of which Lesage was a part; secondly, the tableaux which they represent constitute to a large extent a faithful representation of the life of the period, in spite of the fact that Lesage preferred to give greater emphasis to certain themes or types than to others. These, it would appear, are the ones he knew best and observed first-hand. While it is true that some of the tableaux may be of Spanish provenance, in particular those intercalated romantic tales which form a good portion of Le diable boiteux, Lesage's adaptation of these, assisted by his own observation and creativity, gives to the novels their French spirit, tone and flavor. As a result, both Le diable boiteux and Gil Blas, despite their foreign elements, are original. Having chosen such a flexible genre as the novel, Lesage manages to create and develop two works charming for their delightful wit and merry satire on the manners and customs of his times.

Microfilm $3.75; Xerox $13.05. 290 pages.

JEAN MESCHINOT: LES LUNETTES DES PRINCES. A CRITICAL EDITION.

(Order No. 61-3568)

Bernard Michael Toscani, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor George O. Seiver

Jean Meschinot was one of the most famous poets of his day, and his name is mentioned favorably throughout the sixteenth century by such poets and historians as Marot, Fabri, Tory, Pasquier, Cretin, Bouchet, La Croix du Maine, and du Fail.

Meschinot's principal work, Les lunettes des princes, was the greatest printing success of the late fifteenth and early sixteenth centuries, along with the Testament of Villon. Les lunettes received no fewer than thirty editions between 1493 and 1539.

The principal purpose of this dissertation is to present an accurate text. In addition to the printed editions of Les lunettes, there are three manuscripts extant. The oldest of these, Nantes 651, dates from about 1480. The second, Tours 905, is closely related to the 1494 edition, the second printed by Estienne Larcher in Nantes. The third manuscript, Bibliothèque Nationale fonds français 24314, appears to be based on the editions printed in Paris by Trepperel (1499) and Lenoir (1501). This manuscript presents a number of odd readings not found elsewhere.

The earliest dated printed edition was done in 1495 by Larcher. Among the other ten incunabula, the undated edition printed by Jean du Pré in Paris is particularly important, for it may antedate the 1493 Nantes edition, and it is the apparent model for all the editions printed in Paris.

The numerous texts of Les lunettes can be divided into two groups, which in turn may be subdivided. The Nantes group includes the Nantes and Tours manuscripts and the two editions of Larcher. Included in the Paris group are the Bibliothèque Nationale manuscript, the editions printed in Paris, as well as the four done in Lyon and the two in Rouen.

As for the selection of the basic text of Les lunettes, it would seem logical to accept the Nantes manuscript. However, since it has a number of readings not found in any of the other texts, and since a considerable number of corrections would have to be made in that text, the 1493 Nantes edition has been preferred.

The introductory chapter of the dissertation presents a review of critical literature dealing with Meschinot. The two most significant discussions of Meschinot are the monograph of Arthur de la Borderie, Jean Meschinot. Sa vie et ses oeuvres (Paris: Champion, 1896), and the chapter in Pierre Champion, Histoire poétique du XVe siècle, Vol. 2.

The second chapter of the introduction is divided into the following sub-headings: resumé of content, sources, form and versification, syntax, vocabulary, and conclusion.

Most literary histories list Meschinot among the grands rhétoriqueurs. In reality, Meschinot, a Breton who was a soldier by profession, was not in the main stream of the Burgundian school. It is true he knew and corresponded with Chastellain, but Meschinot wrote Les lunettes about 1460, well before the time of Molinet, Cretin, Bouchet, and Jean Marot.

Of the techniques associated with the grands rhétoriqueurs, Meschinot makes extensive use only of rime équivoque, and of the ten different kinds of interior rhyme listed by Kastner as typical of the school, Meschinot employs only one, namely, rime entrelacée.

The main sources of the poem are the Bible and the proverbs popular in the fifteenth century. Meschinot's language and verse forms reflect his position as a transitional figure. Unlike most of the rhétoriqueurs, he was not a great Latinizer. His concern for justice and his defense of the poor characterize his poetry.

Microfilm $3.85; Xerox $13.50. 300 pages.

THE DANE COUNTY SMALL CLAIMS COURT, ITS FUNCTIONS AND SOCIAL IMPACT.

(Order No. 61-3154)

Ira John Rapson, Jr., Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor James Earley

The study of the Dane County Small Claims Court was undertaken with two major objectives. The first was to obtain a detailed factual account of what the court does and how it does it. Continued refinement of our social and economic institutions requires continued effort at systematic evaluation. Such social accounting is now in the developmental stage for courts and court systems. The second objective was to shed some light on the Economic and social problems brought before the court. The huge volume of disputes suggests that our free market system breaks down in some sizable minority of transactions with resort to court processes required to bring about the culmination of transactions which are normally expected to be concluded by voluntary negotiation.

A 350 case random sample was selected from the court records and data from the records were classified and tabulated. In addition, 65 defendants were interviewed in a study designed to explore the nature of defendant problems.

The case load of the court was about 7,000 cases per year from a community of approximately 54,000 households. The great majority of the defendants were consumers, the actions were primarily debt default actions, and the plaintiffs were primarily business and professional firms. The plaintiffs were primarily small businesses, such as gas stations and independent grocery stores or professional firms, such as doctors and hospitals. Surprisingly, installment debt incurred to purchase consumer durables was involved in fewer cases than might be expected.

Collection agents participated in about 40% of the cases and lawyers in about one-third. Most defendants did not appear in answer to summons and there were very few contested cases.

The defendants were mainly working class people, married and with young children at home. There was a disproportionate number of young defendants who had acquired family responsibilities but who had not finished high school. There was also a disproportionate number of very large families with young children represented.

Budget analysis indicated that the defendants have a substantial misallocation of income with fixed payments usually so large that inadequate income is left to cover non-fixed expenses such as for food, clothing and automobile operation.

The general conclusions are that this court is very efficient and effective in enforcing the legal rights of plaintiffs. This is usually accomplished by encouraging voluntary settlement through threatened resort to compulsion. However, in many cases pressure on the defendant to meet one or a few of his obligations does not lead to a solution of the defendant's problems and may make them worse. One major pattern which was revealed was that although the budgetary problems of the defendant are apparently related to the use of installment credit, the incidence of default tends to be shifted to those creditors who are at a competitive disadvantage in collecting debts. If greater participation by the defendants could be achieved, the court could probably do more toward working out remedies which protect the strict legal rights of plaintiffs while better meeting the needs of defendants. However, thoroughgoing solutions to consumer-defendant problems probably cannot be achieved through the small claims court as it is presently organized.

Microfilm $2.75; Xerox $9.00. 198 pages.

THE COLLECTANEA AS A BIBLIOGRAPHICAL TOOL

(Order No. 61-4194)

Theodore Christian Hines, Ph.D.
Rutgers University, 1961

Major Professor: Ralph Robert Shaw

The collectanea was first distinguished as a mechanical means for handling information by Julia F. and Kendall Morton (1954). The concept was subsequently developed by Ralph R. Shaw (1958) and Maurice F. Tauber (1960). The collectanea is defined as a form of systematic subject bibliography embodying significant original or excerpted content with each entry, and duplicating portions of the content when items could logically appear under more than one heading.

This study identifies a number of existing information retrieval tools which are actually collectanea and which have common characteristics. They are briefly described. It shows that they are important research tools, that they involve considerable investment, and that claims of economy or novelty of method are made for most of them. These examples include: the Morton Collectanea, the Bio-Sciences Information Exchange files, the U.S. Patent Office files, the New York Times Morgue and other newspaper morgues, and Battelle Memorial Institute specialized information files. Features which these systems have in common are identified and discussed.

The Human Relations Area Files are described in considerable detail. System costs are given for the Files and a cost per use calculated. The cost elements are: a. cost of indexing; b. cost of producing the physical tool; c. cost of locating citations; and d. cost of placing the cited passage in the hands of the user.

An alternative bibliographic tool providing the same service as the Files is proposed and the details of its compilation given. Cost figures on a comparable basis to those for the Files are presented for the proposed published index. Costs are also given for a single copy of the index in card form and for producing a single copy of the present Files. It is demonstrated that claims for such advantages of the collectanea as browsability and suggestability are balanced by similar unsubstantiated claims for the display and suggestability afforded by more conventional bibliographic tools such as indexes.

The system costs of the collectanea studied are higher than those of the proposed index, whether these are calculated for multiple or single copies.

Some theoretical observations on the collectanea form are followed by the conclusions that: the collectanea concept is a useful one. The costing procedure offered is workable and useful. Alternatives to the collectanea include state-of-the-art studies and encyclopedic summaries as well as other bibliographic forms. The considerations offered are relevant to some machine indexing systems and to some retrieval systems which are not collectanea, such as files in which abstracts are duplicated. As a mechanical information retrieval device, the collectanea has higher costs than other tools providing the same service except in unusual circumstances in which the use level is high and special conditions can markedly reduce input costs. Microfilm $3.05; Xerox $10.60. 233 pages.

THE LIBRARY OF CONGRESS CLASSIFICATION IN THE UNITED STATES: A SURVEY OF OPINIONS AND PRACTICES, WITH ATTENTION TO PROBLEMS OF STRUCTURE AND APPLICATION.

(Order No. 61-3434)

Alethia Annette Lewis Hoage, D.L.S.
Columbia University, 1961

A study designed to (1) survey the development and structure of the Library of Congress Classification in relation to its use; (2) survey librarians' views and determine the extent of their direct and/or modified use of it as a classification aid; and (3) analyze and make suggestions for use of the Classification by patrons.

The main sources of data were five questionnaires, interviews, and available related literature. The sample of 117 participating libraries was chosen from a list compiled by the Library of Congress staff in 1954. Questionnaires were developed for library administrators, chief catalogers, classifiers, public service librarians, and patrons. Responses were received from librarians in 75 per cent of the institutions. Patrons in nine university, college, special, and public libraries completed questionnaires.

The findings of this study indicate that the characteristics that facilitate the use of the Classification outnumber those that hinder its application in libraries in the United States. It was rated highest for comprehensiveness, practicality and up-to-dateness. All of its special features were considered useful although some of the librarians considered the parenthetic numbers and "general special" category of little value. A majority of the classifiers reported that a comprehensive index and more assistance in interpreting the schedules are needed.

The Classification is being used in special, college, university, and public libraries. More special libraries are using it, but more university libraries have chosen it for reclassification. In this sample most of the administrators reported that the system is the best one for their libraries, and the catalogers estimated that they accept 90 to 99 per cent of the numbers in the schedules and on the cards and proof-sheets. The Classification is used to arrange a variety of non-book materials as well as books.

Public service librarians stated that they use the Classification primarily as a location device, but 44 per cent

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reported that they use it constantly, frequently, or often as an aid in doing reference work. It does not appear to be difficult to teach nonprofessional employees to use the Classification although few training records are kept and most of the teaching is done on an informal basis. Patrons used the Classification mainly to locate a specific title on the shelves. However, some of them used it when searching for material on a topic, or to select substitute titles for those not found.

Few records other than those pertaining to modifications of the Classification are kept. One library has a classified catalog, seventeen maintain public shelf lists. No active staff committees concerned with classification were reported. Few cost and no use studies had been made in the libraries in this sample. The evidence suggests that systematic reviews, objective studies, and improved in-service training programs are needed.

A majority of the patrons reported that they had been acquainted with this classification for one or more years, but had received no instruction in using it. They usually obtained the call number from the dictionary catalog before going to the shelves for material. Most of them found what they wanted; some found additional related material; and few sought help in their search. The public service librarians believed that more than half of their patrons need assistance which they usually give on an informal, individual basis. This system of instruction is not adequate, and more efficient methods are discussed.

Suggestions for further research include studies of the acceptance of centralized classification, use of the Classification as an aid in reference service, patron behavior, and the classification process.

Microfilm $3.20; Xerox $11.05. 245 pages.

MANAGEMENT THEORIES IN PUBLIC LIBRARY ADMINISTRATION IN THE UNITED STATES, 1925-1955.

(Order No. 61-3446)

Arthur Thomas Kittle, D.L.S.
Columbia University, 1961

By tracing and analyzing the interplay between library administrative policy and the human aspects of management, the study shows the extent to which concepts of administration-staff relationships in public libraries have paralleled, in substance and in time span, developments in comparable aspects of administrative theory in the field of management. It has approached the subject through the literatures of management and librarianship and through a case study of a public library system.

Basic ideas associated with the evolution of twentieth century management theory are identified and classified into groups representing three major trends in the development of the theory: (1) management by scientific method; (2) management through organization; and (3) management by process and principle. A development of management theory in public library administration is identified in the literature of librarianship from 1925 to 1955. Material is classified as follows to coincide with the three major themes in management theory: (1) scientific management and library administration; (2) organization and public library management; and (3) management principles and library personnel. The Enoch Pratt Free Library in Baltimore, Maryland, was selected for the case study in this research, and three aspects of its development are reported: (1) growth and extension of services; (2) growth of personnel; and (3) administration-staff relationships.

An analysis of these developments reveal that the beginnings of management theory occurred in the nineteenth century and that several librarians during that early period expressed an interest in a businesslike approach to library administration. At the turn of the century when management's approach applied the methods of science to industrial work, librarians also referred to the use of these principles. The ideas of scientific management, however, were not treated prominently in library literature until after World War II, some thirty-five years after their emphasis in the industrial world.

Management's use of organizational theory was paralleled in the 1930's by the librarian's attention to library organization, a trend that probably accounts for his delay in considering concepts of scientific management in library activity. Emphases on the importance of personnel were observed in both fields. The industrial worker as a human factor in management received greater consideration about the time the library employee was accorded greater personal respect through his relations in a more formal structure of personnel administration.

In 1882, almost twenty years before the service motive objective became prominent in business, the Enoch Pratt Free Library was established to render service and to assume social responsibilities within the community. After 1925 the Librarian's continuing emphasis on economy and efficiency reflected an awareness of similar developments in management theory. The activities of planning and organizing a new Central Library coincided chronologically with the emphasis on organizational theory in the management field. The importance placed by the Library on a professionally trained and experienced staff paralleled the significance given professionalization and executive leadership in management theory. The Library's stated objectives, professional principles, and standards of service implied awareness of progress toward a broader philosophy of management thought.

While management theory developed steadily after the 1920's, a parallel development, comparable in substance and in time span, occurred in the public library field. The existence of management problems had been noted in library literature, and evidence revealed that their origin and nature were discussed within the framework of management theory. Public librarians had available for use an applicable body of technical knowledge in the form of explicit concepts in the management field, and from 1925 to 1955 they made use of that knowledge in their administration of libraries.

Microfilm $3.75; Xerox $13.05. 289 pages.

PROXIMITY AND EQUICONTINUITY IN TRANSFORMATION GROUPS

(Order No. 61-3493)

Jesse Paul Clay, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor W. H. Gottschalk

Let (X,T) be a transformation group with compact phase space X and arbitrary phase group T. In section 1, we define four proximity relations in X and study some of their properties. The notions of almost equicontinuous and weakly almost equicontinuous are defined and characterized in section 2. Section 3 consists of examples which have been chosen to illustrate various aspects of the theory. As a general reference for the notions occurring in this paper, consult the Colloquium Volume of Gottschalk and Hedlund (Gottschalk, W. H., and Hedlund, G. A., Topological dynamics, American Mathematical Society Colloquium Publications, vol. 36, Providence, 1955).

Four proximity relations, L,M,P, and Q, in X are defined in section 1. We show that when P is closed, P = L and P is an invariant closed equivalence relation. L is characterized as the union of all orbit closures contained in P and it is shown that P = Q implies that (X,T) is coterminous, i.e., P = Q = L = M. The productivity of L and M are proven and the existence of least invariant closed equivalence relations S and R in X such that (X/S,T) and (X/R,T) are repletely distal and regionally repletely distal is stated and proven also in this section. There are several results which describe L,M,P, and Q under such hypothesis as X minimal, T abelian; T regionally mixing; and the like. Finally, by applying the theory developed in this section, we were able to weaken substantially the hypothesis of a theorem recently proven by J. D. Baum (An equicontinuity condition in Topological dynamics, Proceedings of the American Mathematical Society, vol. 12 (1961), pp. 30-32).

Two weaker types of equicontinuity conditions, almost equicontinuity and weakly almost equicontinuity are introduced in section 2. It is shown that locally almost periodic is equivalent to almost equicontinuous and pointwise almost periodic; almost equicontinuity and weakly almost equicontinuity are productive; and weakly almost equicontinuous is characterized by (X,T) being coterminous. The existence of least invariant closed equivalence relations S_1, S_2, and S_3 in X such that $(X/S_1,T)$ $(X/S_2,T)$, and $(X/S_3,T)$ are almost equicontinuous, weakly almost equicontinuous, and locally almost periodic, respectively, is pointed out; the latter requires T to be pointwise almost periodic. The results of this section also produced a weakening of the hypothesis of a theorem proven by Ellis and Gottschalk (Homomorphisms of transformation groups, Transactions of the American Mathematical Society, vol. 94 (1960), pp. 258-271).

Most of the examples in section 3 have appeared in the literature. Several notable examples of flows which have contributed to the general theory of topological dynamics are further illuminated by applying the theory developed in sections 1 and 2.

Microfilm $2.75; Xerox $3.60. 63 pages.

COMPLETELY INTEGRABLE SYSTEMS OF FLAT PFAFFIAN EQUATIONS

(Order No. 61-3872)

Yeaton Hopley Clifton, Ph.D.
Columbia University, 1961

Two results are proved concerning H. Whitney's theory of flat differential forms. The first is a generalization of Frobenius' theorem. The second is a new criterion for flat forms.

1. The theorem to be proved is as follows: let $\omega^1, \ldots, \omega^r$ be a family of flat 1-forms, defined near a point $x \in R^n$ $(0 < r < n)$ and completely independent at x. In order that the system

$$\omega^1 = \ldots = \omega^r = 0 \tag{1}$$

of equations be completely integrable at x it is necessary and sufficient that the flat $(r+2)$-forms $d\omega^i \omega^1 \omega^2 \ldots \omega^r$ $(1 \leq i \leq r)$ vanish near x.

It is necessary to define the terms completely independent and completely integrable. For every number $\rho > 0$, let $U_{x,\rho}$ denote the ball of center x and radius ρ. ω^i are completely independent at x if there exists a number $\sigma > 0$ and a Lipschitzian coordinate system $g: U_{x,\sigma} \to R^n$ such that

$$|\omega^i - dg^i|_{U_{x,\rho}} \leq \rho L \quad (1 \leq i \leq r)$$

for some $L > 0$ and all $\rho \leq \sigma$. It is equivalent to say that the functions $f^i(y)$ $(1 \leq i \leq r;$ y near x), obtained by integrating ω^i along the line segment from x to a variable point y, are the first r coordinate numbers of a Lipschitzian coordinate system defined near x.

System (1) is completely integrable at x if there is a Lipschitzian coordinate system g near x such that system

$$dg^1 = \ldots = dg^r = 0 \tag{2}$$

has the same set of solution curves as system (1).

The proof of necessity offers no difficulty, being modelled on the classical proof. In the sufficiency proof, integral curves of system (1) are constructed by polygonal approximation. It is shown that the union of all the integral curves through a point is an $(n - r)$-dimensional integral variety. It is found that these are in fact coordinate $(n - r)$-planes of a certain Lipschitzian coordinate system g which satisfies the requirements of the theorem. Each

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step of the sufficiency proof makes use of Stokes' law and of the inequalities inherent in the definition of flat forms.

In case $\omega^1, \ldots, \omega^r$ are sharp, complete independence at x is equivalent to linear independence at x. Hence we have a true generalization of the classical Frobenius theorem.

The notions of complete independence and complete integrability are invariant under Lipschitzian coordinate transformations. Therefore this generalized Frobenius theorem may be applied to Lipschitzian manifolds.

2. The new criterion for flat forms is as follows: Let ω be a differential form having bounded, measurable coefficients, and let σ be the current having the same coefficients as ω. ω is flat if and only if $d\sigma$ has bounded, measurable coefficients. If ω is flat, $d\sigma$ has the same coefficients as $d\omega$.

The proof makes use of smoothing and is based on Whitney's notion of weakly flat forms.

Microfilm $2.75; Xerox $3.00. 60 pages.

SOME COMPUTATIONAL METHODS FOR THE STUDY OF DIATOMIC MOLECULES

(Order No. 61-3423)

James William Cooley, Ph.D.
Columbia University, 1961

A number of computational techniques are presented for the automatic machine calculation of the structure and properties of diatomic molecules. An automatic procedure is described which uses the Boolean operations of a binary computer for constructing N-electron pure state wave functions from a set of one-electron functions. Use of such automatic procedures permits one to calculate, by variational methods, electronic wave functions from a large number of electronic configurations and avoid the use and limitations of the self-consistent field procedure. The problem of minimizing a function of several variables was investigated and a search procedure which fits successive quadratic surfaces to calculated values was developed and programmed. The calculation of tables of molecular integrals of Slater-type orbitals, which have been published separately, is described. The numerical method for solving the radial Schroedinger equation for bound states is described and an improved eigenvalue correction formula is derived. An analysis of the procedure and some practical means for improving its convergence and accuracy are also given. The technique was programmed as a computer subroutine and used for obtaining nuclear wave functions and expectation values of properties of some diatomic molecules. An LCAO calculation of an electronic wave function for H_2^+, with a full optimization of the non-linear parameters by the minimization procedure mentioned above, was performed for the purpose of investigating the role of the orbital exponents and the applicability of the Virial Theorem, the Hellman-Feynman Theorem, and the static charge cloud model. The results lead to some suggestions which will be of use when applying similar methods to many-electron systems. The vibrational-rotational spectrum of H_2, HD, and D_2 was calculated with two electronic wave functions reported by other workers and excellent agreement with experiment was obtained. A number of molecular constants which are required in the interpretation of radiofrequency spectra are also given.

Microfilm $2.75; Xerox $7.40. 157 pages.

THE INTEGRAL AS AN AVERAGE ON A GROUP OF TRANSLATIONS IN A SUBINVARIANT MEASURE SPACE

(Order No. 61-3366)

Robert Sumner Fishman, Ph.D.
Boston University Graduate School, 1961

Major Professor: Philip T. Maker

If for each i the sequence of points $\{G_i\} = \{a_1, \ldots, a_{N_i}\}$ is a finite group and if $G_i \subseteq G_{i+1}$ for all i we call the sequence $\{G_i\} = \{a_1, \ldots, a_{N_i}\}$ a monotonic sequence of finite groups.

Given a measurable group (X,S,μ) with $\mu(X) = 1$, $f(x)$ summable on X and $\{G_i\} = \{a_1, \ldots, a_{N_i}\}$ a monotonic sequence of finite groups in X, then as Maker[1] has shown,

(1) $\lim_{i \to \infty} \frac{1}{Ni} \sum_{n=1}^{Ni} f(x+a_n)$ exists a.e. (almost everywhere) and is denoted by $f^*(x)$

(2) $f^*(x+a_n) = f^*(x)$ for all n

(3) $f^*(x)$ is summable and $\int_X f^*(x)\,d\mu = \int_X f(x)\,d\mu$

(4) If invariance of a measurable set under all the translations a_n implies that its measure is 0 or 1, then

$$f^*(x) = \int_X f\,d\mu \text{ a.e.}$$

In this paper we generalize Maker's theorem[2] to a larger collection of measure spaces by replacing the condition of invariance $[\mu(x+D) = \mu(D)$ for all measurable D] by the condition of sub-invariance $[\mu(x+D) = \mu(D)$ whenever $x+D \subseteq D$ and D is measurable]. We illustrate the extension and give an application on the real line. We then show that if $X = [0,1)$, S is the σ-ring of all Lebesgue measurable sets and μ is Lebesgue measure on S then $\chi_R^* = 0$, where R is a non-measurable subset of the real line. We then investigate the possibility that the $f^*(x)$ of the extended theorem be an integral on a collection of functions which contains the linear collection of all Lebesgue summable functions as a proper subcollection, or equivalently, that the set H of subsets C of X for which χ_C^* exists be a σ-ring which contains the σ-ring of all Lebesque measurable subsets as a proper subcollection. With the aid of the axiom of choice this is shown not to be the case.

1. Maker, Philip T.: The Average of a Function on a Measurable Group (Submitted for publication, March 1961).

2. Subsequent to the completion of this dissertation it was discovered that B. Jessen (D. Kgl. Donske Vid. Selsk.,

Math-Fys Medd. Vol. 22, no. 14 (1946)) obtained a result which coincides on the real line with Maker's theorem.
Microfilm $2.75; Xerox $3.00. 42 pages.

COMPLETE HOLOMORPHS AND CHAINS IN PARTIALLY ORDERED GROUPS

(Order No. 61-3778)

John Grover Harvey, II, Ph.D.
Tulane University, 1961

Chairman: Paul F. Conrad

G. A. Miller has shown that the holomorph of an abelian group of odd order is complete. This leads us to investigate necessary and/or sufficient conditions that would cause the holomorph of a group to be complete. The first chapter proves the following necessary and sufficient condition.

Theorem 1. If G is an abelian group and if $x \to 2x$ is an automorphism of G, then the holomorph of G is complete if and only if G' is a characteristic subgroup of the holomorph where G' is the image of G in its holomorph.

By assuming that G satisfies the hypotheses of this theorem it is then shown that if the automorphism group of G is abelian or if G is elementary then the holomorph of G is complete.

The proof of Theorem 1 is intimately connected with the crossed homomorphisms mapping the automorphism group of G into G. Hence, Chapter One also contains an investigation of these crossed homomorphisms, and some interesting results of independent interest is obtained concerning these mappings.

In Chapter Two the following analog of Theorem 1 is proved.

Theorem 2. If G is an abelian o-group in which $x - 2x$ is an automorphism and for which the group of o-automorphisms of G can be ordered, then the o-holomorph of G is o-complete if and only if G' is an o-characteristic subgroup of the holomorph.

Then it is shown that if G satisfies the hypotheses of Theorem 2 and if G has well-ordered rank, or if the group of o-automorphisms of G is abelian, or if G is o-elementary, then the o-holomorph of G is o-complete.

Chapter Two then concludes with some examples of o-complete groups and the following theorems.

Theorem 3. Any divisible, torsion-free, abelian group can be ordered so that (i) its group of o-automorphisms can be ordered and (ii) its o-holomorph is o-complete.

Theorem 4. Suppose that D and N are o-groups and that $G = D \oplus N$, lexicographically ordered from the left, then G is o-complete if and only if D and N are o-complete and $N' = \theta \times N$ is o-characteristic in G.

Chapter Three concerns itself with the problem of when a chain in a partially ordered group is a totally ordered subgroup and arrives at the following results:

Theorem 5. If G is an Archimedian po-group, if R is a maximal chain of G, if $0 \in R$, and if R is convex, then R is a totally ordered subgroup of G.

Theorem 6. If L is an l-group, if R is a maximal convex chain of L, and if $0 \in R$, then R is a totally ordered subgroup of L.

Microfilm $2.75; Xerox $3.00. 49 pages.

EXTENSIONS OF ORDERED ALGEBRAIC STRUCTURES

(Order No. 61-3779)

Wilbur Charles Holland, Jr., Ph.D.
Tulane University, 1961

Chairman: Paul F. Conrad

This thesis is concerned essentially with totally ordered groups (o-groups) and totally ordered rings (o-rings). The notion of a Cauchy sequence in an arbitrary o-group is defined and it is shown that it is always possible to embed an o-group in a "completion"; that is, in an o-group in which every Cauchy sequence converges. This completion is shown to be equivalent to the completion by Cauchy filters or that by Dedekind cuts.

Next, immediate extensions and archimedean extensions of o-groups are studied, and their relationships to the extension by Cauchy sequences is clarified. In particular, there is a close relationship between pseudo-sequences in an o-group and Cauchy sequences in a factor group of the o-group. This fact leads to some criteria for an o-group to be maximal (c-closed) or maximal archimedean (a-closed).

The possibility of embedding rings in divisible rings is studied. A ring with identity is embeddable in a divisible ring if and only if it is torsion free. An o-ring is embeddable in a minimal divisible o-ring, unique to within equivalence. In certain cases it is possible to extend an o-ring by Cauchy sequences.

Certain groups of triangular matrices are studied. These can be ordered in some cases, and using this device it is shown that a free group can be ordered in such a way that it is possible to embed it in a divisible ordered group.

A section of examples includes: 1) An R-group which cannot be ordered, 2) An o-group of rank three not embeddable in a divisible o-group of rank three, 3) A divisible abelian o-group whose group of o-automorphisms cannot be ordered, and 4) An orderable group with a partial order which cannot be extended to a total order.

Ordered rings are studied by using the natural valuation on to an ordered semigroup. In an o-ring the union of all proper convex right ideals is a two-sided ideal containing every proper right left ideal.

A structure theorem for o-rings of finite rank is given. If such a ring has a left identity then every idempotent is a left identity. Microfilm $2.75; Xerox $3.80. 67 pages.

ON THE STRUCTURE OF CERTAIN CLASSES OF TOPOLOGICAL SEMIGROUPS

(Order No. 61-3780)

Anne Lester Hudson, Ph.D.
Tulane University, 1961

Chairman: Paul S. Mostert

In the study of topological semigroups the following question arises quite naturally. If S is a semigroup and the multiplicative and topological structure are known for a certain "critical" subset of S, does this in some way determine the multiplicative and/or topological structure of S? This paper is concerned with this problem in three classes of semigroups.

The first class considered consists of semigroups which are topologically closed n-cells, $n \geq 2$. The question considered here is: if the multiplication on B, the bounding (n-1)-sphere of S, is $xy = x$ for all x and y in B, is it possible to describe the multiplication throughout all of S? The answer to this question is given in the following theorem which is proved.

Theorem: Let S be a semigroup which is topologically an n-cell, $n \geq 2$. Let B be the bounding (n-1)-sphere of S and assume for x and y in B, $xy = x$. Then the following cases occur:

1) If $S = K$, the minimal ideal of S, then $xS = x$ for each $x \in S$.

or 2) If $S \neq K$, then K is a deformation retract of S and each element of K is a left zero for S. Also there exists a standard thread, T, in S such that:

(i) $S \setminus K^{\circ} = BT$.

(ii) if b_1, b_2 are in B, t_1 and t_2 are in T and if $b_1t_1 = b_2t_2$, then $t_1 = t_2$. Also $(b_1t_1)(b_2t_2) = b_1(t_1t_2)$.

Since all standard threads are known, this completely describes the multiplication of the semigroup S. Examples are given of a semigroup as described in the theorem for any given dimension n and with a non-trivial proper kernel.

The second class of semigroups considered are semigroups whose topological space is a non-compact n-dimensional manifold, $n \geq 2$. Here it is assumed that such a semigroup S has an identity and a compact connected (n-1)-dimensional group G containing the identity. The "critical" subset of S is the group G which determines the multiplicative structure of S. The theorem proved concerning this class of semigroups is as follows:

Theorem: Let M be a semigroup which is topologically a non-compact manifold of dimension n, $n \geq 2$. Suppose M has an identity and there exists in M a compact connected (n-1)-dimensional group G containing the identity. Then there exists in M a thread T with identity such that $M = GT$ and for $t \in T$, and $g \in G$, $gt = tg$.

Since all threads with identity have been described this theorem gives the multiplicative structure of the semigroups of the second class.

The third and last collection of semigroups considered consists of semigroups S which are compact connected, have a zero and the property that $S = ES = SE$, where E denotes the set of idempotents of S. It is known that if S has a unit and is compact and connected then $H^n(S;G) \cong H^n(K;G)$ where K is the minimal ideal of S and $H^n(A;G)$ denotes the n-th Alexander-Čech cohomology group of A with coefficients in G. Since S/K, the Rees Quotient of S by the ideal K, is a compact connected semigroup with zero, and since $H^n(S,K;G) \cong H^n(S/K;G)$ it suffices to consider only semigroups which have a zero. Thus K is the "critical" subset which determines the cohomology of S. The question considered here is a more general one and arises when the hypothesis that S has a unit is replaced by the hypothesis that $S = ESE$, assuming now that S has a zero. It has been conjectured that in this more general case, $H^n(S;G) = 0$ for all $n > 0$. This conjecture holds for $n = 1$, however, no final results have been obtained for $n > 1$. This conjecture and a slight generalization are considered. In particular, a necessary and sufficient condition for $H^n(R;G) = 0$ for $n > 0$ and all closed right ideals R of S is proved. Also, an example is given of a compact connected semigroup S with zero such that $S = SE$ and $H^1(S;G) \cong G$ for all groups G. This shows that the hypothesis that $S = ESE$ is necessary.

Microfilm $2.75; Xerox $3.60. 61 pages.

A COMPARATIVE STUDY OF THE ACHIEVEMENT OF EIGHTH AND NINTH GRADE STUDENTS IN BEGINNING ALGEBRA

(Order No. 61-4501)

Fred Russell Lawson, Ed.D.
The University of Oklahoma, 1961

Major Professor: Glenn R. Snider

The problem was to determine what differences in achievement would result from teaching algebra to the more academically able eighth grade students when compared to the teaching of algebra in the ninth grade to students of similar ability. The study was carried out in order to test the null hypothesis that there is no significant difference of achievement in algebra between the more academically able eighth and ninth grade students.

Additional hypotheses tested included: (1) there is no significant difference in algebra achievement between boys and girls, (2) there is no significant difference in algebra achievement between the students with I. Q. scores between 118.5 to 141 and those with I. Q. scores between 99 to 118.5, (3) there is no significant difference in the achievement of traditional concepts in algebra between the students in the class using traditional materials and those students in the classes using the School Mathematics Study Group materials.

The data were collected by the use of a standardized algebra achievement test administered to 66 eighth grade students and 62 ninth grade students enrolled in beginning algebra in Alice Robertson Junior High School, Muskogee,

Oklahoma, during the first semester of the 1959-60 school year. The students were divided into two classes within each grade. They were selected on the basis of their intelligence quotient, achievement in arithmetic and the recommendation of their mathematics teacher.

Analysis of the selection data was made to determine the similarities of the classes. Analysis of the algebra achievement scores was made comparing the eighth grade with the ninth grade, each class with every other class, boys with girls, and higher ability groups with lower ability groups.

From the results of this study the following conclusions were made:

1. The eighth grade students achieved significantly greater scores in algebra than did the ninth grade students.

2. The eighth grade students made significantly greater gains in algebra achievement than did the ninth grade students.

3. There were no significant differences in gains in algebra achievement between the upper ability groups and the lower ability groups.

4. Eighth grade students achieved traditional algebra concepts through study of the School Mathematics Study Group materials as well as through study of traditional materials.

5. No significant variations in algebra achievement can be attributed to sex differences.

The following recommendations were made:

1. School officials should give serious consideration to the possibilities of offering beginning algebra to the more capable eighth grade students.

2. School officials should not be reluctant to institute the newer mathematics programs such as that of the School Mathematics Study Group.

3. Further experimentation is needed in the comparison of desired achievement in the teaching of traditional algebra and the newer mathematics concepts.

4. Further investigation and research is needed relative to the secondary school mathematics curriculum.

Microfilm $2.75; Xerox $3.00. 55 pages.

TOPICS IN THE THEORY OF SCHLICHT FUNCTIONS

(Order No. 61-3535)

Thomas Harold Mac Gregor, Ph.D.
University of Pennsylvania, 1961

Supervisor: Orhan H. Alisbah

This paper considers certain problems concerning schlicht functions. Let R denote the class of functions $f(z) = z+a_2z^2+a_3z^3+\cdots$ which are regular for $|z| < 1$ and satisfy $\mathrm{Re}f'(z) > 0$. Such functions are schlicht in $|z| < 1$. Several analytic and geometric properties of functions in R are obtained. We find that $|a_n| \leqq 2/n$ for $n=2,3,\cdots$ Each function in R maps $|z| < 1$ onto a domain which covers the circle $|w| < 2\log 2-1$. Also, these functions map the circle $|z| < \sqrt{2}-1$ onto a convex domain. Another result is: the partial sums of functions in R are schlicht in $|z| < 1/2$.

A similar study is made for the subclass of R consisting of the functions whose derivative lies in the disc $|w-1| < 1$.

Next there is a discussion of uniformly schlicht functions. A regular function is called uniformly schlicht in a domain if the absolute value of its difference quotient has a positive lower bound. Each uniformly schlicht function is schlicht. Conversely, a function which is schlicht in a domain is uniformly schlicht in any compact subset.

For the functions uniformly schlicht in $0 < |z| < 1$ with a pole at $z=0$ the Bieberbach area theorem is improved. Indeed, in this case the complement of the image domain has positive area. For such functions a few distortion theorems are established.

Next we consider the functions uniformly schlicht in $|z| < 1$ and for them obtain coefficient estimates and sharpen the Koebe 1/4 - theorem. We ask: what is the nature of a domain such that it is the image of $|z| < 1$ under a uniformly schlicht function? This leads, in particular, to the result that the mapping of $|z| < 1$ onto any convex domain is uniformly schlicht.

This paper contains a proof of the theorem: each function regular and schlicht in $|z| < 1$, normalized by $f(0)=0$, $f'(0)=1$, maps $|z| < 1$ onto a domain whose width in every direction is not less than $\pi/2$. There is a new and simple proof of the known result: if $f(z)$ is regular and schlicht in $|z| < 1$, $f(0)=0$, $f'(0)=1$, and the image domain is convex then the values of $f(z)$ cover the disc $|w| < 1/2$. Finally, there are estimates for the radii of starlikeness and convexity for functions regular and schlicht in $0 < |z| < 1$ and having the form $f(z)=1/z+a_1z+a_2z^2+\cdots$.

Microfilm $2.75; Xerox $3.80. 66 pages.

VIBRATIONS OF AN ELASTIC PLATE UNDER TENSION

(Order No. 61-3958)

Charles John Martin, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: George H. Handelman

The eigenvalue problem associated with the transverse vibrations of a thin circular elastic plate under initial plane stress is formulated by means of variational principles for general structural members. The problem is attacked by using minimum principles as well as by the solution of the differential equation and corresponding boundary conditions.

The differential equation governing the free vibrations of a thin circular plate is of the form $\nabla^4u - \gamma^2\nabla^2u = \mu^2u$, where $\gamma^2 \geqq 0$ is directly proportional to the tension acting initially on the middle plane of the plate and ∇^2, ∇^4 are the harmonic and biharmonic differential operators respectively. Using minimum principles, upper bounds for μ^2 are readily obtained. The principles are formulated in terms of Rayleigh quotients. By means of the ordinary Southwell method, we are able to find lower bounds to the first eigenvalues and by extending Southwell's technique, can obtain lower bounds to the higher eigenvalues corresponding to the deflection patterns which contain nodal circles.

Using the ordinary perturbation methods we are able to find approximate eigenvalues μ^2 for small γ^2. Since γ^2 is not restricted, it is necessary to find a singular perturbation solution for large γ^2 by rewriting the differential equation in the form $\nabla^2 u + (1/\gamma^2)\nabla^4 u = (\mu^2/\gamma^2) u$. Since the coefficients in the differential operators are required to be analytic a small disk has been inserted at the center of the plate. Two cases are then considered, that of a weightless disk and that of a weighted disk.

From the structure of the differential equation in which the perturbed differential operator is of higher order then the unperturbed operator, and $1/\gamma^2$ is assumed very small, it is expected that the leading coefficients in the perturbation expansion of μ^2, should approximate the eigenvalues of the circular membrane under tension. Numerical and analytic calculations verify this.

Microfilm $2.75; Xerox $5.20. 105 pages.

ON THE CONTINUATION OF SOLUTIONS OF A LINEAR ORDINARY DIFFERENTIAL EQUATION WITH POLYNOMIAL COEFFICIENTS

(Order No. 61-3455)

Robert Theodore Mertz, Ph.D.
Columbia University, 1961

A differential equation of the form $0 = \sum_{\alpha=0}^{n} p_\alpha(z) \cdot z^\alpha \frac{d^\alpha}{dz^\alpha} w(z)$, where $p_\alpha(z)$ is a polynomial of degree m ($\alpha = 0,1,\ldots,n$), is studied. Series solutions $w(z) = z^\mu \sum_{\alpha=-\infty}^{\infty} w_\alpha z^\alpha$ require that the w_α satisfy a linear difference equation with polynomial coefficients.

A coefficient function $f_3(A,r,\mu)$ is constructed and shown to provide coefficients satisfying the requirements at certain critical values $\overline{\mu}$, so that $w(z) = \sum_{\alpha=-\infty}^{\infty} f_3(A,r,\overline{\mu}+\alpha)\, z^{\overline{\mu}-r+\alpha}$ converges in an annulus and satisfies the differential equation. Using a Barnes-type integral, a continuation formula is derived giving linear relationships among solutions represented by such series in adjacent annuli.

This coefficient function uses an infinite determinant of multidiagonal form, a variation from the van Koch normal form, which is shown to converge.

The solutions and relationships thus provided are well suited to computation on high-speed electronic computers.

Microfilm $2.75; Xerox $5.40. 106 pages.

RESPONSE SURFACE DESIGNS WITH INTEGER-VALUED FACTORS

(Order No. 61-3679)

Donald Lee Meyer, Ph.D.
University of Minnesota, 1961

It is desired to estimate a real-valued function, ϕ, where ϕ is dependent upon certain factors, $x_1, x_2, \ldots, x_k$ which may be written as $\eta = \phi(x_1, x_2, \ldots, x_k)$ and whose domain is the Euclidian k-space F. N experiments are performed at N points in the space F (or at N combinations of factor levels) and responses, y_u, (u = 1, 2, ...,N), are observed. Interest in the function is confined to a subspace of F called the experimental region R.

Assuming ϕ is a polynomial of degree d, the uth response is: $\eta_\mu = \beta_0 X_0 + \beta_{1\mu} X_{1\mu} + \beta_2 X_{2\mu} + \cdots + \beta_k X_{k\mu} + \beta_{11} X_{1\mu}^2 + \cdots + \beta_{kk} X_{k\mu}^2 + \beta_{12} X_{1\mu} X_{2\mu} + \cdots +$ etc. or in matrix form, $\eta = X\beta$, where η is an N by 1 vector of responses, X is an N by k matrix whose u^{th} row contains the values of the powers and products of the values of the k factors for the uth point in the space F, and β is an L by 1 vector of partial regression coefficients where $L = C_d^{k+d}$.

Following standard least squares procedures, the fitted regression equation is given by $y = Xb + e$, where y is an N by 1 vector of observed responses, b is an L by 1 vector of unbiased estimates of the corresponding β's, and e is an N by 1 vector of residuals assumed to be independently an identically distributed with means of zero and variances σ^2.

The term, design, is used to represent the particular configuration of points in F which are used in a given experiment. Let $\mathrm{Var}(y_x)$ be the variance of the estimated response, $\tilde{y}$, at the point, x, in F. Then, associated with each design is a function $V(x) = N\,\mathrm{Var}(y_x)/\sigma^2$, called the variance function of the design. This function provides a measure of the precision of the estimated response at any point in F. Let $\bar{x}$ be a k by 1 vector of means of the points defining a particular design. A design is termed a rotatable design if for any two points in F which are equidistant from $\bar{x}$, say x* and x**, the equality $V(x^*) = V(x^{**})$ holds. That is, a rotatable design has the property that the contours of the variance function are circles, spheres, or hyperspheres (depending on k) centered on $\bar{x}$.

In the present study only designs of second-order for two and three factors are considered. That is, attention is confined to designs which allow estimation of all the coefficients in a second-degree polynomial involving either two or three factors.

A design is termed near-rotatable, if the variance function for the design has contours which deviate from sphericity by an amount less than the classical 3^2 or 3^3 factorial (which are second-order designs).

The problem was to find near-rotatable designs when the factors were integer-valued and d = 2 and k = 2 and 3. This problem was attacked by examination of the variance function of a large number of possible designs with the aid of an electronic computer.

The restriction of integer-valued factors arises frequently in educational and psychological experiments since the measurement of certain factors such as "degree of

learning" is by "number of correct associations," etc., which are measured on integer scales.

Tables of several designs for integer-valued factors are given together with their variance function, the number of points required and an index of rotatability which is a measure of the lack of sphericity of the variance function. Orthogonal blocking patterns for certain of the designs are provided and the effect of bias due to terms of third-order is considered.

Two original experiments in the field of psychology are given in order to exhibit the design and analysis of response surface designs.

Microfilm $2.75; Xerox $8.20. 177 pages.

SOME INVARIANT HYPERSURFACES

(Order No. 61-3275)

Michel Germain Ossesia, Ph.D.
University of Pittsburgh, 1961

The generating collineations of certain simple groups in $(p+1)/2$ or $(p-1)/2$ variables and of order $p(p^2-1)/2$, where p is a prime number greater than three, have been determined by M. M. Culver. In addition, it has been shown that if Δ is a primitive root of GF[P] and ω a primitive pth root of unity the $p+1$ linear forms $A_k = x_1 + \omega^k x_2 + \omega^{k\Delta^2} x_3 + \cdots + \omega^{k\Delta^{(2i-2)}} x_i + \cdots + \omega^{k\Delta^{p-3}} x_{(p+1)/2}$, $k = 0, 1, 2, \ldots p-1$, $A_p = x_1$, are either permuted cyclically among themselves or transposed by the generators of the group. The aims of this study are: (a) to determine properties common to two particular hypersurfaces, invariant under the special simple collineation group of order 1092 in seven variables; (b) to determine properties shared by all members of a class of hypersurfaces in six-dimensional projective space, of which the two previously mentioned hypersurfaces are members; (c) to extend these results to a class of hypersurfaces in $(p-1)/2$-dimensional projective space invariant under the special simple collineation group of order $p(p^2-1)/2$.

With $p = 13$ and $\Delta = 2$, a simple collineation group of order 1092, G_{1092}, is obtained. Two hypersurfaces $F_2 = \sum_{i=0}^{13} A_i^2 = 0$ and $F_4 = \sum_{i=0}^{13} A_i^4 = 0$, both of which are invariant under G_{1092} are found to have certain points, tangent lines, tangent planes, and tangent hyperplanes in common. In general it is found that each member of the class of hypersurfaces $\left\{F_{2n} = \sum_{i=0}^{13} A_i^{2n} = 0,\ n \not\equiv 0 \text{ modulo } 13\right\}$ contains the points $Q_2 = (0,1,0 \ldots 0)$, $Q_3 = (0,0,1, \ldots)$, $\ldots$ $Q_7 = (0,0, \ldots 1)$ and that all the members of this class with degrees of the same residue class modulo 13 have the same contact multiplicities at these points with lines Q_iQ_j, $i = 1, 2, \ldots 7$, $j = 2, 3, \ldots 7$. This is determined by analyzing the system of equations $\sum_{i=0}^{13} A_i^{2n} = 0$, $x_1 = x_2 = \ldots = x_i = \ldots = x_{i+j} = \ldots = x_7 = 0$, with $i = 2, 3, \ldots 7$; $j = 1, 2, 3$; $i + j \equiv 0, 1, 2 \bmod 3$. In addition, those hypersurfaces with degrees of the same residue class modulo 13, have common tangent hyperplanes at the points Q_i. For any prime p greater than three such that $p(p^2-1)/2$ is the order of a simple group, the members of the class of hypersurfaces $\left\{F_{2n} = \sum_{i=0}^{p} A_i^{2n} = 0,\ n \not\equiv 0 \text{ modulo } p\right\}$ display similar behavior at the points $Q_2 = (0,1,0, \ldots 0)$, $Q_3 = (0,0,1,0, \ldots 0)$, $\ldots$ $Q_{(p+1)/2} = (0,0, \ldots 1)$. Those members with degrees belonging to the same residue class modulo p are found to have the same contact multiplicities with the lines Q_iQ_j, $i = 1, 2, \ldots (p+1)/2$, $j = 2, 3, \ldots (p+1)/2$ at these points, and to have common tangent hyperplanes at these points.

Microfilm $2.75; Xerox $3.00. 37 pages.

ON A GENERALIZATION OF MEHLER'S INVERSION FORMULA AND SOME OF ITS APPLICATIONS

(Order No. 61-3938)

Paul Lester Rosenthal, Ph.D.
Oregon State University, 1961

Major Professor: F. Oberhettinger

Mehler and Fock in their respective papers in 1881 and 1943 were concerned with the Legendre or Mehler transform whose upper index or order is zero; this paper is concerned with a generalization to an upper index which can be a non zero complex number. It is shown that the Fourier inversion integrals are special cases when the order is given certain non zero values. It is also shown how certain formula relating to boundary value type problems can be expressed in terms of the Mehler transform or generalized Mehler transform. An example is given in which the generalized Mehler transform is computed for a particular function and a closed form is found; then the inverse transform is computed and the original function is obtained. Microfilm $2.75; Xerox $3.00. 40 pages.

SUMMABILITY OF INFINITE SEQUENCES BY SUBMATRIX METHODS

(Order No. 61-3285)

William Frank Steele, Ph.D.
University of Pittsburgh, 1961

Let $A = (a_{mn})$ be an infinite matrix. The matrix formed by deleting some of the rows of A is called a submatrix. A one-to-one correspondence is established between the submatrices of A and the points of the interval $0 < E \leq 1$ by associating with each point E in this interval the submatrix of A whose nth row is deleted if and only if $a_n = 0$ in the nonterminating binary expansion $0.a_1a_2a_3 \cdots a_n \cdots$ of E. The submatrix of A corresponding to E is designated by A(E), and the same notation is used for the corresponding summability method. The matrices referred to are regular and with a_{mn} real.

The submatrices of A are studied to determine the circumstances under which submatrix summability of a sequence is carried over to the matrix A itself. The relationship between the submatrices of a matrix are investigated as well as sequences of submatrices that sum a given sequence.

It is found that due to the wide variety of regular matrix methods no sweeping generalities can be made concerning the properties of the submethods of a completely arbitrary regular matrix. However, by placing certain restrictions on a matrix and considering only those matrices satisfying conditions not severe enough to exclude the more familiar summability methods, a number of interesting results are obtained.

Two lemmas, useful in subsequent work, are given, citing necessary and sufficient conditions for a bounded sequence to be summable by a matrix A whenever it is summable by a submatrix. It is then shown that in the case of methods satisfying

$$\lim_{m\to\infty}\sum|a_{mn} - a_{m'n}| = 0,\ m' > m,\ m' - m \text{ bounded}$$

that in order that a bounded sequence be summable by a matrix A it is sufficient that it be summable by a rational or a zero bounded irrational submethod. Such submethods are, of course, defined. The matrices of Abel, Borel, Cesàro, Euler, Hölder, Riesz, and certain Nörlund matrices satisfy the conditions imposed, and corollaries concerning these methods are stated.

Sequences of submethods are then investigated, and it is shown that if (a) a bounded sequence is summable by a sequence of submethods $A(E_n)$, it is not necessarily summable to the same sum by $A(E)$, where $\lim_{n\to\infty} E_n = E$, and (b) the sum of the bounded sequence by the submethod $A(E)$ need not be the same as the limit of the sums by the sequence of submethods.

Theorems concerning the circumstances under which two regular methods are equivalent or consistent are given, and necessary and sufficient conditions are stated in terms of submethods of various types of matrices. Finally, it is shown that a set of equivalent submethods of a matrix A may be finite or nondenumerable, and that such a set may be either open or closed.

Microfilm $2.75; Xerox $3.00. 38 pages.

PARTITIONS INTO BOUNDED SUMMANDS FROM ARBITRARY SETS

(Order No. 61-3561)

Leon Steinberg, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Emil Grosswald

Let $S = \{s_j\}$ be a monotone sequence of positive integers having no common divisor, and let τ be a positive number. Define

$$F(x) = \prod_{s_j\le\tau}(1-x^{s_j})^{-1} = 1 + \sum_{n=1}^{\infty} P(\tau,n)x^n \qquad (1)$$

Then $P(\tau,n)$ represents the number of partitions of the integer n into summands from the sequence S and less than or equal to τ.

Szekeres [4] has obtained an asymptotic formula for $P(\tau,n)$ when S is the sequence of natural numbers, and Mitsui [3] and Grosswald [2] have considered the case in which $S = \{p_j^k\}$ where k is a positive integer and p_j is the jth prime number. The present paper attacks the problem of finding asymptotic formulae for $P(\tau,n)$ for arbitrary sequences S.

We shall say a sequence S is of class $\Phi(c,g(\tau))$ if

$$c = \min\{\text{cardinality } a_k/k \ge 2\}$$

where

$$a_k = \{s_j/s_j \not\equiv 0 \pmod k\}$$

and $A_o - A_o(k) \ge g(\tau)$ for sufficiently large k where

$$A_o = \sum_{s_j\le\tau} 1 \quad \text{and} \quad A_o(k) = \sum_{s_j\le\tau \text{ and } s_j\equiv o(\bmod k)} 1$$

Since we have specified that S has no common divisor, $c \ge 1$. Bateman and Erdos [1] have shown that $c \ge 2$ is a necessary and sufficient condition for the eventual monotonicity of the partition function.

By transforming the generating function and employing the methods of contour integration and Farey dissection an asymptotic expression for $P(\tau,n)$ is obtained when $A_o\tau^2/g(\tau)\cdot n = 0(n^{-\epsilon})$ for some $\epsilon > 0$. This expression possesses an error term depending upon the constant c. Since for most sequences of interest one may take $g(\tau) = \mu A_o$ where $\mu > 0$, the expression given for $P(\tau,n)$ is usually valid when $\tau \le n^{\frac{1}{2}-\epsilon}$ for some $\epsilon > 0$. By a slight modification of the proof, asymptotic formulae for $P(\tau,n)$ are obtained for all sequences S when $\tau < n^{\frac{1}{3}-\epsilon}$ for some $\epsilon > 0$ and $\log^3 n = o(A_o)$.

The initially derived expression for $P(\tau,n)$, which contains certain transcendental parameters, is next cast into the form

$$P(\tau,n) = \frac{(n+\frac{A_1}{2})^{A_o-1}}{\prod_{s_j\le\tau} s_j\cdot\Gamma(A_o)}\cdot\left(1 + 0\left(\frac{A_o^3\tau^2}{n^2}\right)\right) \qquad (2)$$

when $c \ge 3$ and A_0 grows faster than τ^ϵ for some $\epsilon > 0$. Here

$$A_1 = \sum_{s_j\le\tau} s_j$$

Finally equation (2) is simplified to

$$P(\tau,n) = \frac{n^{A_o-1}}{\prod_{s_j\le\tau} s_j\cdot\Gamma(A_o)}\cdot\left(1 + 0\left(\frac{A_o^2\tau}{n}\right)\right) \qquad (3)$$

which is an extension of the well known result for finite sequences.

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Microfilm $2.75; Xerox $4.00. 71 pages.

CONTINUITY AND UNCERTAINTY OF INTERPOLATING RATIONAL FUNCTIONS

(Order No. 61-3004)

Robert Franklin Steward, Ph.D.
Auburn University, 1961

Supervisor: Nathaniel Macon

Some continuity properties of polynomials are extended to rational functions. For x fixed, the rational function,

$$y = \sum_{j=0}^{k} a_j x^j \Big/ \sum_{j=k+1}^{n+1} a_j x^{j-k-1}, \qquad (1)$$

is a continuous function of the n+2 variables $a_0, a_1, a_2, \cdots, a_{n+1}$. If the real number pairs (x_i, y_i), $i=0, \cdots, n$, determine a unique irreducible interpolating rational function of the form (1) when $x_i = x_i'$ and $y_i = y_i'$, $i=0, \cdots, n$, then the coefficients $a_0, a_1, \cdots, a_{n+1}$ are continuous functions of the x_i and y_i.

Suppose x^* is an approximate number representing the value of some exact number x. If x and x^* are known to satisfy an inequality of the form $x^*-a \leqq x \leqq x^*+b$, then the length of the interval, $|b+a|$, is called an uncertainty in x^*.

The uncertainty in y in (1) is determined for a given uncertainty in each a_j, $j=0,1,\cdots,n+1$. When the coefficients a_j in an interpolating rational function of the form (1) can be computed using a determinantal representation due to M. Bocher, the uncertainty in each a_j is established for a given uncertainty in some y_i. Under this same condition, an approximation to the uncertainty in each a_j due to an uncertainty in some x_i is given. The approximation is valid if the uncertainty in x_i is sufficiently small relative to the value of x_i. These results do not presuppose the existence of a unique interpolating rational function of the form (1) throughout the intervals of uncertainty.

An IBM 650 computer is utilized in exploring the possibility of extending this investigation and an interpretation of the results is given.

Microfilm $2.75; Xerox $3.00. 47 pages.

CONTRIBUTIONS TO THE THEORY OF ESTIMATION BY ORDER STATISTICS

(Order No. 61-3573)

Kamal Yousef Ya'coub, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. John T. Chu

A brief introduction to the concept and terminology of statistical inference, estimation, order statistics and their distribution is given in chapter 1. The use of order statistics as linear estimates is given in chapter 2. The method, given for deriving the best linear-order estimate, is generalized in chapter 3 in order to evaluate the best quadratic-order estimate.

In the process of deriving the quadratic-order estimate, certain summations of order statistic covariances appear. These summations are considered in chapter 4 where theorems are developed and used to evaluate these summations or reduce them to their simplest form.

In chapter 5, the concept of "Semi-order Statistics" is introduced and is used to derive linear-order estimates that do not require computation of covariances or inverse matrixes. The limitations on the efficiency of semi-order estimates is discussed in chapter 6 through the application of "the Cramer - Rao Inequality."

The results in chapters 2, 3 and 5 require computations of moments and cross moments of order statistics. These computations are complicated and time consuming. In chapter 7, theorems are developed concerning relationships among moments of different order statistics and sample sizes. These theorems are employed to simplify the above mentioned computations.

Chapter 8 considers the case of combining two inefficient estimates in order to improve on them. The method is then generalized to linear combinations of any number of inefficient estimates. The latter result is utilized in chapter 5 to combine estimates derived from semi-order statistics.

The examples given in chapter 9 cover computation of moments, linear as well as quadratic-order estimates and semi-order estimates. It is shown that the quadratic-order estimate of the variance for a rectangular parent distribution is more efficient than the mean square deviation. The semi-order estimate which requires but little computations is 83 percent efficient for a sample of size n = 10 drawn from a normal distribution.

Microfilm $2.75; Xerox $6.40. 133 pages.

MINERALOGY

DIFFERENTIAL THERMAL PYROSYNTHESIS AND ANALYSIS

(Order No. 61-3869)

Edgar Marshall Bollin, Ph.D.
Columbia University, 1961

Part I: Differential thermal pyrosynthesis may be considered a modification of differential thermal analysis which allows investigation under closed system conditions. A record is obtained of thermal reactions which occur during synthesis by heating elemental constituents to the fusion point. The equipment provides a continuous curve which records exothermic and endothermic reactions during formation; at higher temperatures, up to and above the fusion point; and subsequent cooling of synthetic compounds. The relative kinetics of the reactions are readily observable providing information applicable to other types of thermal study.

Modifications of the equipment design, changes in the technique, and alteration of physical parameters combine to provide sensitive thermal data. Pyrosynthesis curves of several synthetic minerals demonstrate the range of the method.

Part II: Thermal heads have been developed for the study of corrosive materials by differential thermal analysis which yield reproducible curves for sulfides and related compounds in an oxidizing environment. Further resolution and sensitivity have recently resulted from the utilization of thermocouples covered with a ceramic coating or fused quartz envelopes.

Part III: A sample loading device for D. T. A. is discussed and directions are given for construction. The device forms cylindrical samples of uniform size with closely controlled packing densities in which the thermocouple occupies a central position. An envelope of porous granular aluminum oxide retains the sample in the center of the thermal well. This envelope transmits heat from the head to the sample and restricts dissipation of the heat of reaction from the sample to the head through a medium which is constant in its thermal properties. This envelope also provides an exchange column for vapor state reactions. The head is protected from contamination by oxidation and fusion products by the envelope surrounding the sample. Dissipation of the heat of reaction is more rigorously controlled than in normal techniques by confining the sample to the immediate area of the thermocouple, and by the elimination of direct contact of the sample with the thermal head.

Preliminary tests indicate that the samples formed yield uniform curves of the temperatures at which reactions occur. This applies especially to those reactions which are sensitive to vapor pressure and are highly sensitive to packing densities.

Part IV: Differential thermal investigations have been made of the stability relations of the system CuS (covellite) to CuSe (klockmannite). The thermal reactions have been defined by differential thermal investigations for the system and the bounding compositions of Cu_2S to CuS and CuSe to Cu_2Se.

Compositional ranges from Cu_2S to CuS; CuS to CuSe; and CuSe to Cu_2Se have been synthesized by differential thermal pyrosynthesis in ten per cent molecular increments to study the effect of substitution of selenium for sulfur and the influence of variable copper to anion ratios.

Microfilm $2.75; Xerox $5.80. 117 pages.

MUSIC

HUGO RIEMANN'S "GESCHICHTE DER MUSIKTHEORIE IM IX.-XIX. JAHRHUNDERT," BOOKS I AND II: A TRANSLATION WITH COMMENTARY AND ANNOTATED BIBLIOGRAPHY.

(Order No. 61-4440)

Raymond Herbert Haggh, Ph.D.
Indiana University, 1961

Riemann's Geschichte der Musiktheorie is a unique work, demonstrating his mastery of the literature of music theory. Riemann believed his task was to show the evolution of a concept of tertian harmony in theoretical literature. The interval of the third was a natural musical element, an interval of "nature" which, Riemann was convinced, had been intuitively recognized in folk-practice and which must have been typical of all this music. Riemann believed the third to be a necessary component of a higher level of polyphony, developing from the folk-practice of Northern Europeans and first evolving to an artistic level in England. Fauxbourdon and English discant were the late products of "natural" polyphony, the polyphony of art music resulting from refinements of these practices. Theory, on the other hand, from the beginning altered the natural and instinctive proclivities for certain sounds (thirds) to conform to theoretical preconceptions and inherited authority. Even when we go back to the period when the practice of polyphony is in such a primitive state that "theory appears to be the agent of

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progress," it is a mistake, according to Riemann, to believe that theory provided the stimulus for musical development.

Riemann's preconceptions helped to strengthen his belief in a number of false conclusions. Lack of knowledge of musical sources, not known in his time, led Riemann to wrong conclusions in the case of fauxbourdon. In addition, some of the sources he used as evidence for the beginnings of polyphony are so ambiguous that they must now be discounted in any revision. Yet Riemann has allowed the sources to speak for themselves in most cases, for his intention was to write a history of music theory and not a history of music. It is in the extensive quotations from the sources that the real value of the first two books of the Geschichte der Musiktheorie lies.

It was necessary, in revision, to call attention to Riemann's opinions, which were not uncommon in musicological literature in the 19th century. A thorough examination of all quoted sources was found to be an urgent need. A number of new and definitive editions of medieval treatises are now available, whereas Riemann had to depend on the unreliable versions of Gerbert and Coussemaker. Many treatises still remain in need of thorough philological examination and conclusive studies of these must be postponed until such examinations are made. In many cases the sources were incorrectly quoted by Riemann. The literature devoted to investigations of theoretical subjects since Riemann's time reveals a growth of knowledge on the one hand, but also frequently testifies to the accuracy of Riemann's appraisal. It is with the correction of its minor and major defects that Riemann's work can be restored to even greater usefulness.

Microfilm $8.50; Xerox $30.15. 669 pages.

THE MUSIC EDUCATORS NATIONAL CONFERENCE IN AMERICAN EDUCATION

(Order No. 61-3395)

James Edward Houlihan, Jr., Ph.D.
Boston University Graduate School, 1961

Major Professor: Lee Chrisman

Statement of the problem. It was the purpose of this study to trace the development of the Music Educators National Conference from its establishment in 1907 to 1959. Using the historical method of research, involving documentation, valid selection of material, and interpretation, the following important aspects of this development have been emphasized: the professional program of the Conference, its publications, its leadership, its relationship to other organizations, and its influence upon, and reflection of, contemporary trends in music education and general education. Special attention has been devoted to the national committee study and publications programs of the Music Educators National Conference following World War II.

Sources of data. The principle sources of data for the study have been the publications of the Conference itself. Other important sources have been the publications of related organizations and historical studies by Wesley, Birge, and Molnar.

The historical treatment of the subject has been selective rather than exhaustive, with a minimum use of the anecdotal and biographical material appropriate to a more complete history. The emphasis has been upon analysis and interpretation of aims, methodology and major trends, rather than upon personalities and the detailed recounting of events.

Findings. The first section of the study traces the establishment and parallel development of organizations in the fields of education and music. The growing complexity in the pattern of relationships between various organizations and academic disciplines is noted as associations have multiplied in number and diversity. The National Education Association and the Music Educators National Conference are shown to have combined and consolidated local, state, divisional, and various specialized groups into large, comprehensive organizations. It is also shown how groups of organizations have cooperated in the formation of still larger systems, such as the American Council on Education and the National Music Council, and how American associations have influenced the growth of international organizations.

Important influences in the establishment and early development of the Conference were the many years of experience which music educators had in conjunction with the Music Teachers National Association and the Music Section of the National Education Association. Significant editorial assistance and encouragement were provided by such publications as Philip J. Hayden's School Music Monthly.

An important factor in the continuing effectiveness of Conference leadership has been its success in supplementing and reinforcing the inspiration and enthusiasm engendered at conventions. Among the many activities, projects, and unifying devices, which have served to maintain continuity, facilitate communication, and distribute responsibility among the diverse elements of the Conference through the years, are the following: the many standing committees, the Research Council, the Music Educators Journal, the Competition-Festivals, the national high school bands, orchestras, and choruses, the succession of national study and publications programs, the Journal of Research in Music Education, and the State Presidents National Assembly, particularly the more recent interim meetings of this body in conjunction with other Conference leaders.

With regard to operational procedures and organizational structure, it was found that the Conference has consistently exemplified commendable democratic practices throughout its history in maintaining a balance between national, sectional, and state controls, group and individual responsibility, and elective and appointive positions.

Although there were many negative factors associated with the development of the Contest-Festival Movement, it was found that the role of the Conference has been decisive in establishing procedures, goals, and standards which have, in most cases, met the criticisms of school administrators and music educators on both educational and musical grounds.

Since the establishment of a national headquarters and the appointment of an Executive Secretary in 1930, the

process of unifying and coordinating the multiple elements of the Conference has been greatly facilitated. The Executive Secretaries have played key roles in providing continuity through the successive administrations of elected officials and have maintained consistently high standards of management and leadership.

The Conference has displayed great flexibility in adapting its programs and policies to national emergencies, such as World War I, the depression of the nineteen thirties, and World War II. In the latter, particularly, the Conference contributed valuable services and extended the range of its influence through the Music in American Unity hemisphere program and extensive cooperation with many governmental agencies.

The succession of national committee study and publications programs, Widening Horizons for Music Education, Music Education Advancement, Music in American Education, and Music in American Life, have resulted in valuable contributions to American education. The Music in American Life program, in particular, has been notable for the advancement it has represented in terms of conception, organization, writing, and the utilization of the valuable resources of related organizations and academic disciplines.

As a result of the study, it was recommended that the following studies be undertaken: the compilation of an official history of the Conference; a study of the history and relationship of the ideal of liberal education and the teaching of music in higher education in the United States; a study of the history of the Progressive Education Movement, showing its relation to, and influence upon, the development of music education; a study regarding membership of Conference members in the National Education Association, the American Federation of Teachers, and local independent teachers associations, with emphasis upon the adequacy of their programs in professional and teacher welfare.

It was further recommended that the Conference consider broadening its activities in the field of higher education by exploring avenues of approach to the formation of a more adequate and comprehensive organizational framework for all teachers of music in higher education; that the Conference extend the function of its Continuing Study Committee on Purposes and Goals to include the equation of Conference purposes and functions with its internal structure and relationship to other organizations; that the Conference maintain a continuing review of the adequacy of its liaison with philanthropic foundations and with all segments of the music education profession and representatives of other musical and educational organizations, with regard to the preparation and implementation of programs in cooperation with these foundations.

Microfilm $3.85; Xerox $13.50. 299 pages.

A STUDY OF CHILDREN'S VOCAL LITERATURE WRITTEN BY SELECTED DISTINGUISHED COMPOSERS

(Order No. 61-3648)

Carl N. Shull, Ph.D.
The Florida State University, 1961

The author of a recent study of elementary music series concluded that recognized composers are inadequately represented in current series publications, especially those musicians writing in modern idioms. Based on this finding and the fact that most textbooks designed for elementary music education classes fail to mention the existence of children's vocal music by distinguished composers, the two purposes of this study were established: (1) to discover the nature and extent of music written for children's voices by distinguished composers and (2), to determine the extent to which this literature might be suitable for purposes of the elementary school singing program.

The distinguished composers included in the study have been limited to those nineteenth and twentieth century musicians who have achieved sufficient recognition in music composition to be listed in either Grove's Dictionary of Music and Musicians (5th ed.) or Baker's Biographical Dictionary of Musicians (5th ed.). Other limitations confine the study to originally composed music for children's voices alone and that not requiring dramatic productions.

A total of one hundred and twenty-one composers representing twenty-five nationalities were discovered to have written approximately 1000 titled compositions for children. This body of literature was found to be varied both musically and textually; that analyzed was discovered to be generally subtle in expression, varying in style from those basically traditional in harmonic, melodic, rhythmic, and formal structure (notably Sibelius and Rowley) to those revealing progressive twentieth century attitudes. In the latter category belong Veretti, Krenek, and Bartok whose stylistic features include free rhythmic organization, melodies sometimes marked by extensive chromaticism, non-functional or fluctuating tonalities-modalities, and diverse formal structures. Texts of the literature were selected from folk, anonymous, and composed sources, and are diversified in subject matter and form.

Even though the theoretical learnings stressed within the series are generally present in the distinguished composers' songs, there are various reasons why some of the analyzed music would not be particularly appropriate as series material. These reasons include length, number of voice parts, larger range requirements and higher or lower tessituras than series songs, several textural factors, complexity of the accompaniments, and strongly cultural or nationalistic nature of texts. There remains, however, a considerable amount of music analyzed and a much larger body of music acquired in score that would be suitable series material.

On the basis of evidence contained in the music, styles of composers emerge which may lead children to understand idiomatic practice as a basis for comprehending stylistic aspects of complex compositions intended for adults. Although a large body of songs lie within the vocal and musical capabilities of children, that they also lie within the interest range of children and are well presented

by teachers are prerequisite to their ultimate usefulness with children's choirs or classes.

Chapter I is introductory in nature, stating the problem, purposes of the study, limitations, and research procedure. Chapter II presents the nature and scope of literature by distinguished composers, and a summary of the musical-textual characteristics of music analyzed in Part II. Chapter III is a study of three elementary music series and a general comparison of series material with analyzed music by distinguished composers. Chapter IV includes the summary, conclusions, and suggestions for additional research. Part II contains analyses of children's vocal music by Jean Absil, Bela Bartok, Benjamin Britten, Alexander Gretchaninoff, Edward Grieg, Joseph Haas, Zoltan Kodaly, Ernst Krenek, Alec Rowley, Jean Sibelius, and Antonio Veretti. Appendix B is a thirty-eight page bibliography of distinguished composers' children's music discovered during the period of research.

Microfilm $3.35; Xerox $11.70. 257 pages.

THE FIVE-PART MADRIGALS OF LUZZASCO LUZZASCHI

(Order No. 61-3378)

Arthur Gerald Spiro, Ph.D.
Boston University Graduate School, 1961

Major Professor: Pauline Alderman

Luzzasco Luzzaschi belongs to that group of late sixteenth century Italian composers concerning whom we know practically nothing.

Investigation seems to indicate that he was born c. 1545 and that he studied with Rore in Ferrara. By 1571 or earlier, Luzzaschi was organist to Duke Alfonso II, a position he held until the Duke's death in 1597. Active as composer, organist, and teacher at one of the most cultivated courts in Italy, Luzzaschi's name is most frequently associated with the "Concerto della Dame," that group of lady singers at the Ferrara court whose fame was spread by the chronicles of the period and for whom Luzzaschi wrote his often mentioned volume, the Madrigali ... per cantare et sonare. Upon the death of his patron and the dissolution of the court at Ferrara, little information regarding the composer is available. Evidence is ample that he was the teacher of Frescobaldi, and it is likely that his life came to a close in Ferrara c. 1607.

Luzzaschi's five-part madrigals, to which this study is limited, are contained for the most part in his seven madrigal books published between the years 1571 and 1604. Of the Primo libro, Sesto libro (long considered totally lost), and Settimo libro, no complete copy is extant. However, a posthumous volume entitled Seconda Scelta ... reprints some madrigals from Luzzaschi's last three madrigal publications, that is from the Fifth through the Seventh books. Thus this collection is extremely valuable, for it contains our only known source for Luzzaschi madrigals from his Sixth and Seventh books. (Unfortunately, no evidence to date has uncovered any complete madrigals from the First book.) A few madrigals not contained in any of the seven books were published in various anthologies of the period, and a complete source list of all known Luzzaschi madrigals together with other bibliographical information is contained in Appendix I. In all, Luzzaschi's total output of five-part madrigals numbers at least 186.

The intent of this dissertation is an analysis both technical and historical of these madrigals in order to arrive at some conclusions concerning Luzzaschi's contribution to and significance in the musical literature of the late sixteenth century Italian madrigal.

Beginning with the Secondo libro, the largest of the complete madrigal books and written when the composer was in his very early thirties, the reader is immediately confronted with a volume noted for its balance and clarity and one revealing an understanding of the common practice type of madrigal characteristic of the period. The usual madrigalisms on textually important words are to be found together with other melodic and harmonic peculiarities that go into the making of a personal and individual style.

Probably the most significant aspect of Luzzaschi's madrigal writing is his use of what this writer has termed "melodic interchange of parts," that is the substitution of melodic material among the voices which results in effect in a kind of Stimmtausch. This device is not limited to Luzzaschi's early writing but is employed throughout all of his madrigal volumes.

One does not find in Luzzaschi's madrigals indications pointing to a departure from tradition. Individual madrigals such as his tortuous setting of Dante's Quivi sospiri may stand out and focus attention upon themselves, but on the whole, these represent isolated examples of departure from the norm. Luzzaschi is a stable madrigalist, perhaps even retrospective in outlook and method, and one will have to look well among his works to find signs of a Wert, a Marenzio, or a Monteverdi.

Microfilm $3.00; Xerox $10.35. 229 pages.

A HISTORY OF MUSIC IN JACKSONVILLE, FLORIDA, FROM 1822 TO 1922.

(Order No. 61-3652)

Grier Moffatt Williams, Ph.D.
The Florida State University. 1961

It has long been known that histories of music in America can be neither correct in details nor comprehensive in coverage until local music histories have been made. Sonneck (Early Concert Life in America [Breitkopf and Hartel, 1907]) and, more recently, Johnson ("The Need for Research in the History of American Music," Journal of Research in Music Education, Vol. VI, No. 1 [1958], p. 43) have called attention to the need for comprehensive localized studies in addition to research into the evolution of musical tastes.

"A History of Music in Jacksonville, Florida, from 1822 to 1922" represents an attempt to satisfy, partially, these needs; that is, to (1) present a comprehensive study of music in Jacksonville, Florida, during the first century of the existence of the city; (2) to show the evolution of musical tastes during the same period. The study divides itself logically into three principal chronological divisions:

I. Music in Jacksonville During Territorial Days and Early Statehood (1822-1870)

II. Music During the Tourist Years (1870-1910)

III. Music at the Conclusion of the First Century (1910-1922)

Musical life in Jacksonville during the first period was appropriate in scale to the size of the city which at the time never exceeded 6,000 in population. At least five merchants dealt in musical equipment and between eight and twenty people advertised their services as music teachers. It was possible to obtain musical instruction, also, through academies, singing schools, and schools of music. Opportunities for performance were possible in church choirs, brass bands, minstrels, and recitals. The first concert took place in an academy auditorium and was given by a winter resident, D. D. Griswold. Concerts by local and visiting artists were frequent thereafter. Musical taste of the time leaned toward simple and uncomplicated musical selections with the texts of vocal works stressing moralistic and melodramatic thoughts.

The myriads of tourists and settlers who came to Jacksonville following the Civil War necessitated the construction of many exclusive hotels as well as moderately-priced boarding houses. Music came to be the most useful form of entertainment for the patrons. Formal concerts and the provision of music for informal occasions such as promenades, excursions, lobby entertainment, and dances were the principal functions of music. Many of the world's leading musicians performed in Jacksonville between 1870 and 1910, and there was an active amateur concert life as well. The principal music clubs and organizations were the Apollo Club, Philharmonic Society, Ladies Friday Musicale and the Home Minstrels. Music training could be obtained from three private conservatories in addition to local music teachers. Musical taste of the time displayed a predilection for novel and unusual compositions. Opera was the most popular form of serious composition and dramatic selections from it were used even in church services with the intention of attracting tourists.

After 1910 a decided change took place in music taste of Jacksonville concert audiences. A preference was noticeable for increasingly varied programs and the immense popularity of opera yielded to a desire for such musical works as symphonies, symphonic suites, concertos, and sonatas. Musical instruction could be obtained from private teachers and the three conservatories that had been established during the earlier period. Opportunities for musical performance were present in concert bands, the Jacksonville Orchestra, the Jacksonville Choral Society, and in the choruses and instrumental ensembles of clubs such as the Apollo and Germania Clubs, and the Ladies Friday Musicale.

A brief survey of current music activity in the city shows that a broad and varied program exists which is aggressively promoted and actively supported giving indication that the success of music in the future, as in the past, is assured.

Microfilm $4.65; Xerox $16.45. 363 pages.

NINETEENTH CENTURY SACRED MUSIC OF THE MENNONITE CHURCH IN THE UNITED STATES

(Order No. 61-3653)

Paul Marvin Yoder, Ph.D.
The Florida State University, 1961

The purpose of this study is to establish factors affecting the sacred music of the Mennonites during the nineteenth century and to indicate the influences of these factors as they are reflected in the music. The primary sources of information were Mennonite hymnals and music books, periodicals, historical manuscripts and documents, personal interviews and letters to individuals. This study deals only with the largest branch of Mennonites in the United States which is the most direct link to the Anabaptists of the Reformation Period.

Mennonites in America attempted to resist outside forces which would affect their social and religious customs. Their traditional German hymnody was retained to a large degree until 1800, however the Mennonites included hymn literature of other German speaking denominations in their first hymnals printed in America in 1803 and 1804. A comparison of these early hymnbooks with the first official Mennonite hymnbook in English published in 1902, reveals that significant changes had taken place during this one hundred year period.

Between 1803 and 1902 at least nineteen Mennonite hymn collections were published, thirteen in German totaling fifty-six editions and six in the English language totaling twenty-four editions. Many of these hymn collections contained hymns in both German and English. In addition to the hymnbooks, five singing school or tune books were published; one in German, three in English and one bilingual, printed in no less than twenty-one editions between 1816 and 1900.

In early America, Mennonites sang hymns in unison and without instrumental accompaniment. Part singing was introduced into Mennonite congregations as early as 1840 as a result of the work of Joseph Funk, an itinerant singing school teacher. The importance Funk and his predecessors placed on congregational singing tended to deprecate the use of musical instruments and any type of "special music," choirs, quartets, and solos, in Mennonite churches.

With the exception of the two early hymnals published in Pennsylvania, notation was not included in Mennonite hymnbooks until near the end of the nineteenth century; however, the name of an appropriate tune appeared at the beginning of each hymn. Shaped notation was used in Funk's singing school books, a practice which has been followed by Mennonites in most of their hymnals to the present day.

Tunes from the German chorale and the psalter were employed in the early Mennonite hymnals in German, but were not used extensively in the English hymnbooks. Funk introduced hymns and tunes of English and American origin through his singing schools. Mennonites adopted many gospel songs for use in Sunday schools. As a result, the Church and Sunday School Hymnal published in 1902 was largely comprised of hymns and tunes of English and American origin and contained few of the tunes used by Mennonites one hundred years earlier.

Chapter I establishes the background of Mennonite music in America before 1800. Chapter II is an analysis

of Mennonite hymnbooks in German published in the United States. Chapter III describes the role of the Sunday school in the language transition and the music in the Sunday school. Chapter IV is an analysis of the singing school and tune books of the Mennonites indicating the role of the singing school in the emergence of part singing, the use of shaped notation, and the adoption of English hymns and tunes. Chapter V contains a summary and conclusions with recommendations for future studies. An appendix is comprised of a chronological listing of American Mennonite hymnbooks through the various editions from 1742 to 1960. Microfilm $2.75; Xerox $8.60. 188 pages.

PHARMACOLOGY

STUDY OF THE RELATIONSHIP OF NUCLEIC ACID AND PROTEIN SYNTHESIS TO MAMMALIAN ENZYME INDUCTION

(Order No. 61-3401)

Robert Jay Rubin, Ph.D.
Boston University Graduate School, 1961

Major Professor: Charles J. Kensler

The increase in activity of two hepatic enzymes, tryptophan pyrrolase and benzpyrene hydroxylase, following administration of their respective substrates, has been ascribed to de novo synthesis of protein. For this reason agents known to have profound effects on protein synthesis in other systems were investigated for their effect on induction of these two enzymes. Further, a study was made of the nucleic acid turnover during tryptophan pyrrolase induction. Finally, food deprivation was investigated for its effect on the two enzyme systems.

Dimethylaminoazobenzene (DMAB) fed to adult rats at a level of 0.06% in the diet caused a progressive decrease in the basal level of tryptophan pyrrolase over a period of 42 days and a significant inhibition of the 5 hour-induced level of enzyme, evident as early as 14 days with no further changes seen as late as 42 days. After 240 days of feeding, the basal and induced enzyme levels appeared to return to control levels. There was markedly less enzyme activity in hepatic tumor tissue from induced rats than was found in the adjoining normal-appearing liver. DMAB, administered to rats in a single dose of 25 mg/100 gm body weight 24 hours before induction, had no significant effect on the basal or induced enzyme levels.

Aminopterin (0.645 mg/100 gm body weight) or 5-fluorouracil (200 mg/100 gm body weight), given to weanling rats 24 hours before assay, resulted in a stimulation of the basal level of tryptophan pyrrolase and a biphasic effect on the tryptophan-induced levels. At 1, 3 and 7 hours after the inducer both drugs resulted in an augmentation and at 5 hours (the time of maximum induction in control rats) a suppression of induced enzyme activity. It is suggested that the increase in basal activity is corticoid mediated and that the alternate augmentation and suppression of inducted activity is due to the action of the antimetabolites on two components of enzyme induction: nonsuppression of the corticoid-induced component and suppression of the substrate-induced component. Stimulation of the basal level of enzyme by the antimetabolite did not appear to be a necessary concomitant of suppression of the 5-hour induction since 5 amino, 2-4 bis (benzylamino) pyrimidine had no effect on the basal level of enzyme and yet significantly suppressed the induced level.

Aminopterin was seen to exert no significant effect on the basal or maximum induced levels of benzpyrene hydroxylase.

Feigelson et al. (BBA 32:133, 1959), on the basis of their observation of an increased uptake of P^{32} into RNA several hours after the maximum induced levels of tryptophan pyrrolase are attained, have suggested that enzyme induction utilizes specific RNA templates which must be resynthesized at some time after maximum induction (13-15 hours). These observations could not be confirmed in this laboratory. It appears likely that the data of Feigelson et al. may be due to the effect of corticoids released by non-specific stress. This appeared more reasonable when it was shown that cortisone at a dose of 0.5 mg/100 gm body weight significantly increased the uptake of P^{32} into RNA. Further evidence makes it untenable that enzyme induction utilizes a specific intermediate which must be resynthesized. For, when serial doses of inducer were administered to rats at a 5 hour interval, the second dose of inducer produced a response approximately equal to that seen after the first dose. This would not be expected if the first burst of enzyme induction had used up a critical intermediate.

Fasting of rats resulted in stimulation of the basal levels of tryptophan pyrrolase. Adrenalectomy completely abolished the fasting-induced response as did addition of 5% glucose to the drinking water, indicating that the increase in enzyme was due to stress-mediated adrenal stimulation. The data indicate that in the face of a severe negative nitrogen balance the rat can, presumably, still synthesize large amounts of a specific enzyme. On the other hand, fasting was shown to have no significant stimulating effect on basal benzpyrene hydroxylase activity.

Microfilm $2.75; Xerox $6.20. 128 pages.

AN OBJECTIFICATIONAL THEORY OF AESTHETIC VALUE

(Order No. 61-3776)

Daniel Erwin Anderson, Ph.D.
Tulane University, 1961

Chairman: Edward G. Ballard

The main purposes of the dissertation are (1) to develop a context in which certain terms used in aesthetics --such as 'art,' 'beauty,' 'aesthetic value' and 'value'-- may be given systematic definitions; and (2) to show how these terms so defined may be used in the context.

The argument proceeds from certain basic concepts such as 'experience,' the 'experiential continuum,' and the acts of 'objectification' and 'abstraction.' These terms are defined and discussed in the text, but as they represent basic concepts, much of their clarification proceeds denotatively by use and analysis of examples and illustrations.

In the next step, notions are developed which help to specify the relations of the individual to the context. The notions of "set,"[1] kinds of sets and their interrelations are defined and discussed. The fundamental notions that are believed to be common to all sets are then explicated and discussed. These fundamental notions are categories which are, perhaps, definitory of the human individual. The means whereby sets are altered are then discussed on three levels: the level of the individual, of the group and of the culture.

At this point the context is established, in terms of which experience, including aesthetic experience, can be rendered meaningful. The meanings of aesthetically basic notions are then determined. Value is generically defined as the fundamental relation between subject and object. Value is determined directly by the dominant element of the set. The dominant element, in turn, is determined in part by such things as the individual's past experience, his sensitivity to his environment, and his sensitivity to communications from other individuals. Each of these factors operates on many levels. Value, in this sense, applies generally to all experience. Within the broad area of experience more specific kinds of value are distinguished. In this way such terms as 'aesthetic value,' 'beauty,' 'use value' and 'art' are made meaningful. The relation of the individual-environment contexture to value is given in Chapter VII, on "The Conditions of Value," and Chapter VIII, on "Art, Morality and Society," illustrates the application of the theory to the philosophy of art.

The system developed in the dissertation is a closely interrelated conceptual scheme. Each concept has meaning only in its relations to other concepts in the scheme, and to the scheme as a whole. It is necessary in the development of the system to introduce many concepts which, if they are not new, are at least somewhat different from the concepts usually encountered in the field of aesthetics. For this reason it is necessary to redefine many terms to fit the concepts used in the system. Because of the difficulty inherent in any attempt to "get inside" a system of this sort a brief "glossary of terms" has been appended.

1. The term is psychological, and is not to be confused with the mathematical concept of set. The set functions as a predisposition for certain kinds of experience.

Microfilm $3.70; Xerox $12.85. 285 pages.

THE INTERPRETATION OF THEORY

(Order No. 61-3489)

Herbert Gaylord Bohnert, Ph.D.
University of Pennsylvania, 1961

F. P. Ramsey pointed out in "Theories" (The Foundations of Mathematics, 1930) that the observational content of a theory expressed partly in non-observational terms is retained in the sentence resulting from existentially generalizing the conjunction of all sentences of the theory with respect to all non-observational terms. Such terms, long recalcitrant to explicit definition in observational terms, are thus seen to be avoidable in principle, but only in the form of a single "monolithic" sentence. A way of breaking up such a sentence into manageable pieces for purposes of inference and communication is offered in the present dissertation by initiating the study of what are here called quasi-languages, namely, languages in which communication is effected not only by sentences but also by clauses, namely, sentential formulas which are closed except for a special kind of variable (quasi-constants) for which substitution is not allowed.

It is shown that many concepts of deductive and inductive logic and L-semantics are extendible to such languages without great change and without relativization with respect to context, but that the radic concepts of truth and designation are extendible only in a weaker (but interesting) sense. Relativization to context is made explicit only in pragmatics where clauses are construed as "understood" in an intrascope way, and where concepts of sense, synonymy, and degree of communication between individuals (with respect to a given expression) can consequently be formulated. The process of quasi-interpreting a theoretical language in terms of an observational language is illustrated in a detailed example. In the process, certain collateral questions concerning the "constructional" correlation of languages with differing universes of discourse and differing logical and expressional resources are resolved for the example studied.

Following this, issues in the philosophy of logic, language, and methodology are re-examined in the light of quasi-language analysis. These include: Truth (Correspondence-Coherence), Analyticity, Synonymy, Reduction, Fusion, Empirical Meaningfulness, Ontological

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. **Please order copies by number.**

Commitments of Linguistic Structure, Mind-Body Problem, "The Theoretician's Dilemma."
Microfilm $2.75; Xerox $5.80. 117 pages.

LIFE, REASON AND HISTORY IN THE PHILOSOPHY OF ORTEGA Y GASSET.

(Order No. Mic 61-1567)

Brother Leo Robert Downey, F.S.C.H., Ph.D.
Fordham University, 1961

Mentor: Balduin V. Schwarz, Ph.D.

No one doubts the prodigious influence of the Spanish philosopher, Ortega y Gasset. What is in doubt, however, is the originality of his thought, for nowhere does Ortega explicate his basic metaphysical stand ex-professo. This dissertation is an attempt to discover whether or not Orteganism can be considered an original philosophic structure, or merely an eclecticism.

Ortega's philosophy of history approximates that of Wilhelm Dilthey; his axiology, that of Max Scheler; the leitmotif of his writings is existentialistic, and in metaphysics and epistemology, he parallels the work of Martin Heidegger. Hence the investigation undertaken in this dissertation dictated a methodology of comparison and contrast in which Orteganism would be collated with contemporary philosophical currents.

A close study of the Obras Completas reveals that certain fundamental doctrines are indeed unique to Ortega, enabling him to produce a variant form of existentialism, and so coloring his vision of reality that almost every aspect of his philosophy will bear a distinctive mark. Of these distinctive doctrines, four are of the greatest importance.

The first is that the human reality consists in a dynamic subject-circumstance relationship in which the subject interprets the circumstance in order to survive. Hence the Ortegan formula: Yo soy yo y mi circunstancia. Since it is an already-interpreted world which forms the circumstance of each successive generation, then history becomes an ontological dimension of the concrete man. This permits of a philosophy of history which is organically united with Ortega's fundamental metaphysics.

Secondly, since the circumstantial dimension of man is a social system of received beliefs, it provides an ontological bond which establishes coetaneous individuals into a "generation." It is the generation, rather than the individual, which engenders an historically effective interpretation of the received circumstance. Generations are qualitatively distinct from one another because of the differences within their circumstances. It is impossible to give one transhistorical definition of man: "Man has no nature; he has history." As opposed to the usual existentialist interpretation which speaks of a necessary enmity between the masses and the select minority, Ortega sees the need for a constant entente cordiale between them; in the achieving of the destiny of a generation, each has its own proper rights and obligations. Other significant contributions of Ortega to the theory of generations include his distinction between contemporaneous and coetaneous individuals, the importance he discovers in the intertwining of co-existing generations, and his analysis of vital ages.

Thirdly, the subject-circumstance unity is such that it prescribes a specific destiny for each individual and a collective destiny for each generation; and the degree of fidelity to destiny is the measure of authenticity.

Fourthly, since in the struggle of subject and circumstance the only weapon of subjectivity is that of interpretation, then human life itself possesses an ontological reason--"vital reason." This vital reason has the dual task of formulating plans and then of choosing among them in an effort to attain a specific destiny. Thus vital reason is the wellspring of all living activities, including that secondary type of thinking, reason more geometrico. It is Ortega's contention that human life has been jeopardized by the attempts of modern rationalism to substitute the inept schemes of reason more geometrico for the spontaneous planning of vital reason. Moreover, since generations, too, strive to attain a prescribed destiny, history itself is the result of vital reason (now called "historical reason"), and becomes intelligible when examined from the points of view of successive generations.

Among other original aspects of Ortegan philosophy should be noted his division of convivencia into its inter-individual and collective facets, and his distinction between ideas-creencias and ideas-ocurrencias.
Microfilm $2.75; Xerox $8.20. 179 pages.

THE ETHICAL AND POLITICAL THOUGHT OF GIOVANNI GENTILE

(Order No. 61-3881)

Anthony James Gimigliano, Ph.D.
Columbia University, 1961

This work attempts to outline, and critically consider, the significance and consistency of the ethical and political thought of Giovanni Gentile independently of his metaphysical system. In order to accomplish this it is necessary to briefly review the metaphysics of Actualism, the philosophy of Gentile. Gentile conceived his ethical and political philosophy as entailing his metaphysics. The principal intention of this study is to indicate that his ethical and political considerations do not entail his metaphysics in any significant sense. In fact where the metaphysics is introduced a number of special problems seem to arise.

Actualist ethics reveals itself as a form of ethical idealism, dedicated to the self-realization of man. While Gentile does not attempt the logically impossible task of demonstrating his first principles in ethics, he does offer a vindication of those principles by arguing that self-realization can be the only duty which the individual takes up freely, without coercion and without reservation. Only that duty could constitute a duty which the individual, through free choice, would lay upon himself.

Similarly, the political theory of Actualism develops out of the Actualist commitment to the self-realization of man. The implications of Actualist ethics are made explicit in its political theory. The individual can assent to the State only when that State is a means to the good life. Only insofar as the State serves as a means to such a

life does it legitimately command the allegiance of its citizens. To serve in such a capacity the State, and the laws which it implements, must forever remain subject to reappraisal. The State provides the moral environment in which the individual finds himself and against which he asserts himself as a moral agent. The State is a negative moment of the moral life and its acts are always repressive until the individual identifies those acts as acts which assist him in his search for his more profound self, acts which he would have himself prescribed were he motivated by a completely rational will.

Understood in this fashion the ethical and political thought of Giovanni Gentile has little need for the epistemological idealism of Actualist metaphysics. An attempt is made to distinguish the point at which the epistemological idealism of the metaphysics makes its appearance. In the mature reformulation of his philosophy, particularly in the Filosofia dell'arte, Gentile seems to indicate that this point is in the analysis of sensation. That such an analysis of sensation plays a critical role in the thought of Gentile is indicated by an inquiry into his study of the philosophy of the young Karl Marx.

Gentile undertook a careful analysis of Marx's youthful "Theses on Feuerbach" and as a result concluded that Marx's departures from Hegel arose as a consequence of his analysis of sensation. Thus Gentile was made aware of the importance of such an analysis and in his maturity he indicated that his study of Marx's philosophy contained the germs of his own subsequent system.

In the course of the discussion some of the specialized literature devoted to the work of Giovanni Gentile is considered. While that literature, in the past, has displayed serious shortcomings in many instances, the more recent publications give evidence of commendable objectivity.

It is concluded that the ethical and political thought of Giovanni Gentile does not necessarily entail the metaphysical system associated with his name. The ethical and political thought stands on its own merit and can be judged independently of epistemological idealism.

Microfilm $2.75; Xerox $9.25. 204 pages.

PLATO'S THEORY OF SCIENTIFIC KNOWLEDGE IN THE LATER DIALOGUES

(Order No. 61-3730)

John B. Gruenenfelder, Ph.D.
University of Notre Dame, 1961

Plato's Theaetetus, Sophist, Statesman, and Philebus are examined for a theory of scientific knowledge (ἐπιστήμη). The dialogues are considered as cohesive wholes, and the attempt is to draw out the theory of scientific knowledge from the dialectic of each dialogue. (For example, the entire Philebus is centered around the one-many questions raised at 15b.) Then the individual studies of the separate dialogues are brought together. The conclusions center around 1. The object of scientific knowledge, 2. Judgment, 3. Acquiring scientific knowledge.

It seems that Plato's object of scientific knowledge must be purely determinate and intelligible both for the object of conception and of judgment. Plato does not consider such an object in a purely epistemological context, however, but stresses its ontological character as well. The forms and blends of forms are the pure objects of scientific knowledge. The forms do not appear to be subsistent. Rather, their reality seems to be precisely their determinateness. It is suggested that for Plato to be is to be specific and to be specific is to be. (The criticisms of the forms in the Parmenides seem to lend support to this interpretation of the forms.)

Blended forms are also pure objects of scientific knowledge. They preserve purity of intelligibility and unity of being by the proportion of the blend. In the ontological terms of the Philebus, the forms of the blend seem to be the indeterminate principle and the proportion of the blend seems to be the determinate principle.

Proportion also seems to be a central factor in Plato's theory of judgment and in his use of analogy to achieve scientific knowledge. Plato's theory of judgment seems to be that a judgment expresses a proportionate unity of subject and predicate. The true scientific statement expresses the same proportion as is found objectively.

Division and analogy are examined in regard to acquiring scientific knowledge. In order to divide according to specific forms, analogy may be necessary. A division does not seem to constitute a definition, for the defined object must be specified positively, not merely be distinguishing it from everything else. For this positive specification, analogy seems to be the appropriate method.

Microfilm $3.95; Xerox $13.95. 308 pages.

THE COGNITIVE SIGNIFICANCE OF ART

(Order No. 61-3449)

Berel Lang, Ph.D.
Columbia University, 1961

The cognitive significance of art is viewed in light of a number of issues disclosed in the work of Suzanne Langer, Roger Fry, and I. A. Richards. The 'cognitive content of art' is discussed in connection with Langer's description of the art work as a symbol of the life of feeling. Difficulties of verification are noted in this proposal, and these, together with Langer's distinction between the art work assymbol and symbols within the art work, are accounted for in the more systematic treatment. An ambiguity is discovered in Fry's claim that the 'artistic character of art's cognitive content' is exclusively formal or linear, since he indicates at the same time that the significance of art is in some way related to its expression of emotion. The dilemma to which these conflicting descriptions lead, it is suggested, might be averted by a less restrictive definition of 'artistic' which would include relevant cognitive elements without denying the unusual character of knowledge acquired from art. Richards' conception of the third issue---'truth and belief in the work of art'---is examined in light of his distinction between the scientific and emotive usages of language which asserts the non-referential character of the literary work of art and the inapplicability to it of criteria of truth. Objections are raised against Richards' distinction between the types of linguistic usage, the suggestion being made that a more adequate assessment of art's truth status might be

accomplished by considering statements inferred from the work than by limiting the inquiry to its literal statements.

The issues disclosed in Part I are analyzed systematically in Part II. A criterion of cognition which resembles the verifiability principle of linguistic analysis is stipulated, and it is maintained that application of this criterion reveals what is distinguished as art's primary and secondary cognitive content. Primary content includes elements such as rhythm, color, and the dictionary meaning of words which can be specified in relative isolation from one another and whose range of implication is limited to the work itself. Secondary content is composed of elements abstracted from primary content which presuppose recognition of the work's over-all intention(s)---such as the inference which might be drawn from the primary status of the woman and her dead child in "Guernica." Both types of content are relevant artistically so far as they contribute to the unity of the work and to the aesthetic attitude which this unity evokes. The cognitive content of art is described as 'dispositional' rather than active and is held to be distinguished by this fact from knowledge acquired elsewhere. In common with other types of knowledge, however, art's content is claimed to be subject to judgment in terms of truth---primary content, on the basis of its relations within the work, and secondary content, for its claims beyond the work. The conclusion is reached that while truth is not a sufficient condition for artistic value, it is, so far as the medium permits, a necessary one.

The criterion of cognition applied throughout is limited in scope. But it offers a means of discussing art's cognitive significance in terms relevant to the more general analysis of both cognition and art, and thus leaves the way open for integrating art's cognitive status with that of other enterprises and for detailing more specifically the content which characterizes each of them.

Microfilm $2.75; Xerox $9.25. 202 pages.

FREEDOM AND NECESSITY IN SAINT AUGUSTINE

(Order No. Mic 61-1574)

Reverend Thomas Macho, S.J., Ph.D.
Fordham University, 1961

Mentor: Professor James M. Somerville, S.J.

This exposition of St. Augustine's vision of freedom of the will is based on a direct study of the texts. After a historical survey of the development of Augustine's understanding of man's freedom, a systematic description of his conception of liberum arbitrium is given, taking up successively the double meaning of this term. In its first meaning, as free-will, the three following points are covered: (1) his affirmation of free-will, (2) his notion of the free and that of necessary, (3) the powers and limits of free-will in avoiding evil and doing good. In its second meaning, as freedom, the history of freedom in mankind is reviewed along with its development in the individual.

God is the author of man's free-will and freedom. The divine freedom, of which man's freedom is a participation, is the archetype of human freedom. Man's action is but a cooperation, the initiative always being on the part of God; man's proper act is that of consent. Grace is seen, not as an obstacle, but as a help in the process of liberation of free-will.

There are two characteristics of a free act: the absence of coercion and self-possession. Neither the absence of inner necessity nor the presence of power of choice are constitutive elements of freedom of the will. By the necessary, as opposed to the free, Augustine means that which is not within our power and that by which "quis invitus opprimitur." Freedom and necessity are opposed as volens and invitus or as willing and unwilling. The mystery of freedom is the mystery of willing; and the compatibility of freedom and necessity is made possible. The insight behind these Augustinian notions is the identification of free-will and will.

There are three characteristics of freedom as the perfection of free-will: human freedom is (1) participated, (2) dynamic, and (3) to be achieved by love. A participated freedom means that there cannot be a good use of free-will apart from God, as being cannot exist apart from Him. The metaphysical condition of human freedom is union with God. The dynamic characteristic of freedom means that free-will is subject to a process of liberation both from the intrinsic liability to sin of his created being and from the concupiscence dwelling in him. Freedom granted to redeemed man is a freedom mixed with servitude. Man's progress in freedom is described as a passage from the posse non peccare through the non posse non peccare to the non posse peccare. It can be measured, negatively, by withdrawal from sin and, positively, by adherence to good. Human freedom is a freedom to be achieved by love because love is at the very heart of man's being and is the deepest root of freedom. Grace frees man's will by pouring forth in it a new love or charity and a new delight. This Augustinian doctrine is based on the identification of will, love, delight, and freedom.

The Augustinian vision of man's freedom goes from the freedom of innocent man to that of fallen and redeemed man, from freedom in time to freedom in eternity. Augustine's reflection moves from the phenomenological and psychological level to a metaphysical and theological perspective. The insight underlying his thought is the understanding of the relationship of the creature's dependence upon its Creator: that which is not by itself cannot act by itself. This ontological dependence of the creature on God both for its existence and its operation was developed by Augustine within the framework of the Neo-platonic philosophy. The unifying principle of Augustine's teaching on free-will and freedom is the metaphysical theory of the Plotinian image, modified by Christian thought.

Microfilm $3.80; Xerox $13.50. 296 pages.

THE UPADEŚASĀHASRĪ OF ŚAṄKĀRĀCARYA, CRITICALLY EDITED WITH INTRODUCTION.

(Order No. 61-3576)

Sengaku Mayeda, Ph.D.
University of Pennsylvania, 1961

Supervisor: Professor W. Norman Brown

The Upadeśasāhasrī, which is ascribed to Śaṅkara (A.D. 700-750), the great exponent of the Advaita doctrine, occupies an important position in the history of the Advaita school. It has, however, not previously been fully explored. The text has been edited several times and published in India, but no critical edition exists.

In my dissertation, I have presented a critical edition of the text from eight manuscripts preserved in the India Office Library, one manuscript preserved in the Library of the University of Pennsylvania, and four printed editions. The text is accompanied by a critical apparatus of variants and an introduction.

The introduction mainly discusses the problems of authorship and the formation of the text.

Two methods have been used for the solution of the problem of authorship. The first is to compare the Upadeśasāhasrī with Śaṅkara's Brahmasūtrabhāṣya. Avidyā, nāmarūpa, and five other terms are used in making this comparison. The comparison shows that the Upadeśasāhasrī agrees essentially with the Brahmasūtrabhāṣya in the use of these terms, while all points of disagreement are explicable. Furthermore, a comparison of citations made in both works reveals an accordance of the Upadeśasāhasrī with the Brahmasūtrabhāṣya.

The second method is to examine references to the Upadeśasāhasrī found in works of Śaṅkara's adherents. Sureśvara's Naiṣkarmyasiddhi, Vidyāraṇya's Pañcadaśī, Sadānanda's Vedāntasāra, and commentaries on the text are taken up for examination. All of them support the authenticity of the text.

The formation of the text is discussed on the basis of several critical points which appear in the investigation of the text and from consideration of commentaries upon it and its historical background.

From these investigations, the following conclusions have been reached:

1. The Upadeśasāhasrī, consisting of two parts, metrical and prose, is a genuine work of Śaṅkara, the author of the Brahmasūtrabhāṣya.

2. Each of the nineteen prakaraṇas of the metrical part was originally composed by Śaṅkara independently and separately from any other. The three prakaraṇas of the prose part, which are closely related to one another, form a whole. They were originally written by him independently and separately from the metrical part, presumably later than the latter, at least later than the fifteenth prakaraṇa. These prakaraṇas may have been edited by Śaṅkara's pupil(s) probably after his death, but possibly by himself. The latter possibility seems less likely than that a pupil(s) edited them. When they were edited, the metrical part was placed first and the prose part second.

The prose part is a handy guide for the teachers, while the metrical part is, as it were, a textbook for the pupils.

Microfilm $3.90; Xerox $13.75. 303 pages.

JOHN DEWEY'S CONCEPT OF THE UNIFICATION OF THE SELF: AN EXPOSITION AND CRITIQUE.

(Order No. 61-3893)

Milton Mayeroff, Ph.D.
Columbia University, 1961

John Dewey wrote much on problem solving as the unifying of a discordant situation. In his only work explicitly devoted to problems of religion, A Common Faith, he discusses a type of unification that is the establishment of an enduring harmony in living rather than simply the unifying of a particular situation. Dewey's concept of the "unification of the self" is an attempt to give a naturalistic account of the "generic and enduring change" that is characteristic of the religious unification. He believes that all that is valuable in a religious way of life can be interpreted naturalistically and purified of the "historical encumbrances" that are tied up with belief in the supernatural. Although there is virtually no other discussion in his writings dealing specifically with the unification of the self, much that he was written is relevant to understanding this type of unification.

In Chapter I, I try to clarify Dewey's concept of the unification of the self. Various characteristics of this unification are examined: the enduring nature of the settlement, ends inclusive enough to unify the self, the intervention of imagination in life, natural piety, the involvement in the present, and overcoming the need to fix beliefs. In the course of the exposition various questions are raised that suggest that some important factor in the process of unification has not been considered by Dewey.

In Chapter II, I examine this process from a different perspective and bring out a different dimension of it. Unification of the self is viewed as the overcoming of invidious comparison. Characteristic of lack of unity is that one's sense of self, to a greater or lesser degree, involves invidious comparison in which one experiences oneself as above or below other people in self-worth. This lack of unity is reflected in the way the present is experienced. The present is felt to be "incomplete" and a postponement in comparison to a "more real" or "higher" future. By contrast, the unified self no longer invidiously compares itself with other people, and the present is no longer experienced as a postponement and as always preliminary to something "more real" that is yet to come. I then show in Chapter III that this way of viewing the unification of the self answers questions previously raised regarding Dewey's analysis and further develops his position.

Dewey was very much aware of the increasing impact of science and technology upon our culture. He believed that one of the primary tasks of philosophy was to clarify the nature of science and work out its cultural implications. Traditional philosophy, as Dewey interpreted it, has a theory of knowledge that is contrary to that of the experimental method of science. Since this traditional conception of philosophy is unable to account for the experimental method, he believed it to be irrelevant for our day. In Chapter IV, I show that the conception of the unification of the self that has been developed in the preceding chapters can give important meaning to the distinctive characteristics of the traditional conception of philosophy. The interpretation offered is compatible with the nature of science and is very much relevant for our own day.

The essay closes with a discussion of an aspect of harmonious living that the Deweyan philosophy neglects. This aspect of living is referred to as "a quiet dimension of life" and includes such experiences as retrospective reflection, the awareness and appreciation of death, listening to the rain drops, and silent communion between people. Microfilm $2.75; Xerox $6.00. 125 pages.

HYPOTHESIS AND DEDUCTION IN PLATO'S METHODOLOGY

(Order No. 61-3548)

Lynn Edmondson Rose, Ph.D.
University of Pennsylvania, 1961

Supervisor: Glenn R. Morrow

By "Plato's methodology" is meant his statements of the methods which are to be used by the philosopher or dialectician in refuting, teaching, and discovering. A number of general statements of such methods occur in the dialogues: the hypothetical method is described in the Meno, Cratylus, Phaedo, and Republic, a program for exercise in deduction is presented in the Parmenides, and the method of division is explained in the Phaedrus, Philebus, Sophist, and Statesman.

The statements of the hypothetical method in the four earlier dialogues are shown to be closely akin to one another and to mark a single, distinct stage in Plato's developing methodology. At this stage his view is that once hypotheses are settled upon and sufficiently scrutinized and accounted for, their consequences can be deduced almost automatically.

The hypothetical method is not discussed after the Republic, but Plato never abandons any of the positive aspects of his earlier methodology. He does, however, abandon his earlier attitude that the process of deduction is almost automatic and not worthy of precise analysis. In the later dialogues he seems to be searching for something like a formal logic (although formal logic was probably unknown to him). He needs to supplement his hypothetical method with a general or formal account of the method to be followed in deducing the consequences of a hypothesis.

The Parmenides is next discussed, with emphasis on its role as an expression of the need for some formal method of deduction. In the first part of the dialogue Socrates is led to admit several untenable consequences of Plato's own and cherished theory of ideas; many of these difficulties might have been avoided if Socrates had been properly trained in deduction and had admitted as consequences only those statements which really do follow from the existence of ideas. Plato gives us no general theory of deduction, but he does describe in general terms a procedure which is to be followed by those who need guidance in deducing consequences (136a4-c5). The second half of the Parmenides is an example illustrating how this procedure can be applied so as to give practice and training in deduction.

An appendix to the dissertation is concerned with the method of division, which is a correction of the hypothetical method only insofar as the latter overlooks the need for a deductive logic. The method of division meets this need and supplements the earlier method. Division is not a process of logical deduction, but in the appendix it is explained that this is not as serious a difficulty for Plato, who holds the view that learning is recollection, as it would be for someone who holds no such view.

Several results of this study seem to be new. The connection of the hypothetical method with the Parmenides and with the method of division is emphasized, as is Plato's recognition of the need for a formal logic. The "divided line" passage of the Republic is interpreted in such a way that the traditional quadripartite line is eliminated in favor of an entirely different diagram. The systematic status of the main tenets of the theory of ideas is emphasized, and is shown to bear upon the interpretation of the first part of the Parmenides. It is argued that the structure of the second half of the Parmenides becomes clear when the program given at 136a4-c5 is taken seriously. Finally, a second appendix lists occurrences of ὑπόθεσις and ὑποτίθημι, the words Plato often uses in the technical senses of "hypothesis" and "hypothesize," respectively. This list seems to be more nearly complete than any in the literature.

Microfilm $2.95; Xerox $10.35. 226 pages.

THE PHILOSOPHY OF EXPERIENCE: AN ANALYSIS OF THE CONCEPT OF EXPERIENCE IN THE PHILOSOPHY OF JOHN DEWEY.

(Order No. 61-3904)

Stephen David Ross, Ph.D.
Columbia University, 1961

John Dewey's philosophy is approached from the standpoint of the concept of experience, which is held to be his fundamental philosophic category. The concept of experience is examined in great detail, through all its changes of meaning, in order to indicate how important it is to Dewey, how many problems arise in his philosophy because of it, and to demonstrate the character of his fundamental philosophic method.

"Experience" for Dewey represents a fundamental metaphysical category, through which he attempts to criticize various historical dualisms. It represents the human process which is seen to be a union of various factors--organism and environment, subject and object, what is experienced and how it is experienced; "experience" is a double-barreled word. The human process is viewed as an historical affair, in which various elements are seen to be aspects of a single process rather than separate and discrete. Dewey claims that with such a conception of experience we may develop a logic of experience in which we examine the contexts of ordinary logical distinctions, and constantly work back and forth between the ultimate and proximate subject matters. Without such a category of experience, philosophy is little more than "a beating of wings in the void."

Such a category is but the beginning of philosophy, however, no matter how important it may be. Dewey subsequently develops many of his own distinctions in the light of experience as transaction or interaction. But in his

accounts of immediate and reflective experience, primary and refined experience, serious problems arise. Particularly, we find that Dewey begins to be concerned with experiencing subject matters rather than with the concept of experience which refers to a complex historical human process. This can be seen in his account of pervasive qualities which is at best a difficult notion in his philosophy.

Ultimately these problems lead to difficulties in Dewey's theory of knowledge, both in his account of the role of practice in knowing, and in the ontological implications of his analysis of primary and reflective experience. Notably, it appears that he never offers a satisfactory account of the role of objects of knowledge such as electrons and molecules, which become far too conventionalistic in character.

Other problems arise in connection with Dewey's conception of "an experience," an integral experience unified by a pervasive quality. Dewey's conception of experience becomes honorific, and worst of all, far too intellectualistic, for he overemphasizes the role of scientific thinking in other areas of experience. His account of aesthetic experience never quite seems to include an awareness of the random, trivial, or deliberate but non-scientific elements of experience.

Yet such problems do not entirely nullify Dewey's philosophy of experience. It is suggested that despite the problems which have been mentioned, Dewey's conception of experience offers the possibility of a systematic philosophy of the human process in which all features of experience are unified through a central philosophic category. This category is put forth to represent the human process --propulsive, cumulative, active and yet random, trivial, inconsequential. As this category is developed, as theories of art, knowledge and morals are interpreted in its perspective, it becomes clearer and more sharply defined, and a systematic philosophy emerges. This is Dewey's philosophic method.

Microfilm $3.55; Xerox $12.40. 273 pages.

COMIC AS AN AESTHETIC CONCEPT

(Order No. 61-3911)

David Thoreau Wieck, Ph.D.
Columbia University, 1961

Recent theory is dominated by Croce's dictum that, aesthetic-theoretically, there are no genres or "aesthetic kinds." The present thesis tests (and rejects) this position in respect to "the comic." The strong criterion is adopted that "the comic is an aesthetic kind" if and only if it represents a "modification of aesthetic value."

Croce is shown to overlook the difference in meaning of kind-and-genre terms in aesthetic and in non-aesthetic contexts. Such terms, used in aesthetic contexts, designate kinds of aesthetic organization ("principles of intelligibility"); indicate the appropriate spectator-attitude; identify the justification for interest in the object. Differences in "feelings" are indexical of aesthetically-significant functional distinctions. It is concluded that aesthetic predicates other than "is art" cannot be ruled out by Croce's arguments.

Since there is no agreed-on "theory of the comic," three theories are analyzed in hope of establishing the aesthetic status of the comic. Three approaches are represented: the objective-social (Bergson), psychodynamic (Freud), phenomenological (Volkelt). Bergson and Freud analyze the comic as a non-aesthetic quality. Bergson's theory is internally inadequate, and ends in an evaluation of the comic at variance with the human verdict. Freud's theory is likewise untenable, and fails to make intelligible the higher forms of the comic (comic art; comedy). Volkelt, analyzing comic experience as a kind of aesthetic experience, holds that simultaneous (intuitive) exhibition of apparent-value and value-nullity is comic, is aesthetic, and produces a characteristic state of "absolute superiority" or "freedom." Volkelt incorporates traditional descriptions of experience of the comic--superiority, tension-release, incongruity--and shows that comic effect depends on the aesthetic character of the experience. Difficulties are found, however: appearance-and-nullity-of-value does not hold for all comic objects; the "aesthetic-comic"-"non-aesthetic funny" boundary is unclear; the concept of "freedom" needs amplification.

To develop what is positive in Volkelt, a fresh effort is made to draw distinctions between the aesthetic and non-aesthetic comic, and between the aesthetic-comic and the aesthetic-in-general. Within the "funny in general" four types are identified: the non-aesthetic (e.g., practical or private jokes); the minimally aesthetic (a dog chasing her tail, an enormously fat man), where practical interests are diminished but the spectator's pleasure depends on selection (usually social-habitual) of a certain standpoint; the characteristic aesthetic-comic, where the comic quality is fully objectified, practical interests are subordinated, the judgment "is comic" tends toward universality, and the term "good" is appropriate; the highest form of the aesthetic-comic (Volkelt's "subjective comic"), where, in addition, the comic-aesthetic object embodies a comic world-view or comic way-of-being-in-the-world. The distinction between aesthetic-comic and aesthetic-in-general is drawn along formal, cognitive, and value lines: the comic as a principle of order; as an object of cognitive interest ("aesthetic essence"); as a series of variations in the structure (and hence value) of experience. The comic-aesthetic conjunction, in short, produces a distinct kind of object. It is concluded, therefore, that "the comic is an aesthetic kind," "comic is an aesthetic value-quality."

The present analysis suggests a basis for functional interpretation of aesthetic value. "Good work of art," "good as aesthetic experience," resist interpretation. Where the work of art is comic, "good" can be understood as justified by the comic excellence of the object. If a parallel analysis holds for other "aesthetic qualities," pluralistic clarification of aesthetic value is in prospect.

Microfilm $3.05; Xerox $10.60. 233 pages.

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PHYSICS, GENERAL

A THERMODYNAMIC STUDY OF TWO PHASE REGIONS

(Order No. 61-3943)

Joseph William Bursik, Ph.D.
Rensselaer Polytechnic Institute, 1961

Supervisor: H. C. Van Ness

In this investigation it is shown that for two phase regions the specific internal energy of the mixture, u, and the specific entropy, s, can be written as

$$u = (Tp' - p)\,v + f(T)$$

and

$$ds = d\phi + \frac{f'}{T}\,dT$$

where f(T) is an arbitrary temperature function, p' and f' are derivatives with respect to the argument, temperature, and ϕ is the product of specific volume and p'. ϕ is termed the Clapeyron function. Determination of p(T) and f(T) would obviously permit the determination of all the usual thermodynamic functions in terms of v and T.

When the internal energy function is applied to the saturation envelope f(T) is then expressed in terms of tabulated properties. For several substances studied, including H_2O, f(T) in the liquid vapor region is very closely a linear function of the temperature. For H_2O the maximum deviation from linearity is $\frac{1}{2}\%$ in the vicinity of the critical point.

In order to study the correlation of standard thermodynamic data in the vicinity of the critical point, the existence of several envelopes is proved. The properties of these envelopes are such that small inconsistencies in the data are easily detected.

The expression for the entropy differential shows that the slopes of the ϕ = constant family in the Ts plane have the same value at any one value of temperature. This same property is possessed by an infinite set of polytropic families of curves in ideal gas theory.

When the condition is imposed that for some value or values of polytropic exponent, n, this family or families of curves transform parallel in the two phase Ts plane, the result is that only one family is permitted, namely the ϕ = constant family. This results in two equations for the same family of curves.

$$vp' = \text{constant}$$

$$pv^n = \text{constant}'$$

Elimination of v and integration gives the equation of the vapor pressure curve, p = p(T).

Further, the theory predicts three different linear relationships involving various saturation properties, in each case the slope yielding the value of the exponent, n. Finally the theory yields the result that the polytropic exponent is related to the vapor pressure curve by

$$n = p'^2/pp''$$

where, again, primes denote differentiation with respect to the single argument, temperature.

Several substances, some in the liquid vapor region and some in the solid vapor region, were studied and the agreement with the polytropic theory was found to range from good to excellent.

Microfilm $2.75; Xerox $9.45. 209 pages.

STRESS FUNCTIONS FOR GENERALIZED PLANE STRESS IN ORTHOTROPIC PLATES

(Order No. 61-3436)

Yen-Ti Huang, Ph.D.
Columbia University, 1961

In this paper there is given a solution of the Cauchy-Voigt equations of generalized plane stress, in orthotropic elastic plates, analogous to the Papkovitch solution for isotropic plates. The displacements are expressed in terms of functions which are harmonic in transformed spaces. Microfilm $2.75; Xerox $3.00. 19 pages.

TAYLOR INSTABILITY OF AN INCOMPRESSIBLE PLASMA UNDER A VARIABLE ACCELERATION

(Order No. 61-3526)

John Jarem, Ph.D.
University of Pennsylvania, 1961

Supervisor: Kenneth M. Watson

This paper describes a theoretical analysis of the stability of an interface between dissimilar, incompressible, ionized gases undergoing variable acceleration. This represents a generalization of a study of Taylor instability of fluid and plasma interfaces and of the familiar fluting instability. The cases investigated include plane, cylindrical, and spherical plasma configurations confined by a magnetic field. A perturbation analysis of the unperturbed accelerated plasma motion yields differential equations with time dependent coefficients for the growth behavior of disturbances at the interface.

For accelerations which do not change sign the results are similar to the conventional analysis for surfaces at rest, although interface radial dimensions and velocities

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lead to modifications of the usual stability criterion. An interesting possibility for stabilizing an otherwise unstable surface arises as a result of applying oscillatory driving forces. The effect is physically similar to that of stabilizing an inverted pendulum by oscillating its support, or to the stabilization scheme in alternating gradient accelerators. For the case of a plane undergoing oscillatory motion and supported against gravity, the stability conditions are described by the Mathieu equation. For other prescribed motions, stability criteria based on analytic and numerical solutions of the interface stability equations are presented for the three geometries and for a range of plasma parameters.

Microfilm $2.75; Xerox $9.45. 208 pages.

THE ELECTRONIC STRUCTURE OF LiH AND Li_2 AND THE QUADRUPOLE MOMENT OF Li^7

(Order No. 61-3370)

Sheldon Lee Kahalas, Ph.D.
Boston University Graduate School, 1961

Major Professor: Robert K. Nesbet

Hartree-Fock self-consistent field calculations of the Roothaan (linear combination of atomic orbitals - molecular orbital) type have been carried out on an electronic computer for LiH and Li_2 using an extended basis set of Slater type atomic orbitals. Configuration interaction calculations result in a total molecular energy of 99.34% of the experimental value, and a dissociation energy of 89.33% of the experimental value in LiH. Similar calculations in Li_2 result in 99.40% and 89.9%, respectively, for these two numbers. The energy of atomic Li, which enters the dissociation energy calculation, is calculated to comparable accuracy (99.42%).

Using a general method developed in the present work, the electric field gradient is calculated (with configuration interaction) in LiH and Li_2. With Klemperer, Gold, and Wharton's measurement of the LiH quadrupole coupling constant, the quadrupole moment of Li^7 is found to be -3.56×10^{-26} cm^2. With the Logan, Cote, and Kusch measurement of the Li_2 quadrupole coupling constant, the quadrupole moment of Li^7 is found to be -4.5×10^{-26} cm^2. The best estimate for the magnitude is $(4.0 \pm 0.5) \times 10^{-26}$ cm^2; the sign is unambiguously determined to be negative, in agreement with theoretical predictions from nuclear models. The electric field gradient in Li_2 is found to be a sensitive function of internuclear distance.

The dipole moment of LiH is calculated to be - 5.83 Debyes and the quadrupole coupling constant of Deuterium in LiD to be + 39.24 kc/sec.

Large contributions in configuration interaction occur from $p\pi$ orbitals for LiH and Li_2 and p orbitals for Li.

Another conclusion which should be mentioned is that no Sternheimer correction need be included in the calculation of the electric field gradient, when a Hartree-Fock wave function is used for a closed shell atom or molecule.

In summary, it is found that calculations for the light diatomic molecules, LiH and Li_2, by the SCF-LCAO-MO-STO method, used in conjunction with a large set of basis orbitals and configuration interaction, can yield results of sufficient accuracy that confidence may be placed in the theoretical description of molecular properties by this method.

Microfilm $2.75; Xerox $6.80. 144 pages.

A NEW VARIATIONAL PRINCIPLE IN QUANTUM MECHANICS

(Order No. 61-3761)

Theodore Joseph Newman, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Peter G. Bergmann

In this paper we have developed quantum theory from a q-number (operator) action principle with a new representation invariant technique for limiting the number of independent system variables. It is shown that in a q-number theory such a limitation on the number of variations is necessary, since a completely arbitrary q-number variation implies an infinite number of conditions to be satisfied. This is so since, in a q-number theory, the system variables are matrices which, in most cases, have an infinite number of elements, each of which are independently varied in a completely arbitrary q-number variation.

A brief review of Schwinger's quantum field theory formalism shows that the limitation to c-number variations, while accomplishing the desired limitation on the number of independent variations, is not representation invariant, i.e. under a change of representation, c-number variations applied to the original system variables transform to q-number variations of the new system variables.

It is well known that, in the Hamiltonian formulation of classical mechanics, invariant infinitesimal canonical transformations are generated by constants of the motion. Bergmann and Schiller have shown that it is also possible to generate infinitesimal invariant transformations from constants of the motion in the classical Lagrangian formulation. In the present paper we generalize the work of Bergmann and Schiller to a q-number theory and require that the variations of the system variables in the action principle be the invariant infinitesimal transformations generated by constants of the motion. This accomplishes the desired limitation on the number of independent variations in a representation invariant manner.

The resulting theory is developed in detail for a certain class of Lagrangian functions. A set of commutation relations is derived and a dynamical principle for determining the temporal development of the system is postulated.

A discussion of the results, including consideration of the self-consistency of the formalism developed, is presented.

Finally, a specific problem is worked through and it is shown that the results obtained correspond with those of the usual canonical method of quantization.

Microfilm $2.75; Xerox $4.00. 73 pages.

A THEORETICAL AND EXPERIMENTAL EXAMINATION OF THE VALIDITY OF DIFFUSION ANALYSES AS APPLIED TO UNSATURATED FLOW OF SOIL WATER

(Order No. 61-3247)

Stephen Last Rawlins, Ph.D.
Washington State University, 1961

Chairman: Walter H. Gardner

Diffusion theory, as now applied to certain cases of horizontal movement of water in soil, demands that the progression of a plane of specified water content be directly proportional to the square root of elapsed time. A critical review of necessary criteria upon which this relationship is based shows that it applies only when a restricted set of conditions is met. It is not clear that such conditions are met in reported experimental studies of unsaturated flow of soil water.

An experiment was designed to bring this relation under precise test at all water contents, including those behind the wetting-front, using a gamma ray densitometer. Results of this experiment show quite conclusively that at least for the soil used, the position of all planes at constant water content is related in a non-linear manner to the $\sqrt{t}$. Implications of this failure of the $\sqrt{t}$ relation are reviewed in light of the assumptions on which the relation is based. It is concluded that the most plausible explanation for this is failure of the diffusivity term in the diffusion equation to be a unique function of water content.

Microfilm $2.75; Xerox $3.00. 45 pages.

α^2m/M CORRECTIONS TO HYPERFINE STRUCTURE IN ATOMIC HYDROGEN

(Order No. 61-3470)

Morton Maynard Sternheim, Ph.D.
Columbia University, 1961

The α^2m/M corrections to the ratio of the hyperfine structure of the 1s and 2s states of atomic hydrogen have been evaluated using the Bethe-Salpeter equation. Adding the proton's nonrelativistic kinetic energy $p^2/2M$ and the effects of its Dirac and Pauli moments to the Dirac equation yields identical results. In units of 10^{-6}, the α^2m/M corrections to $R = (8\nu_2/\nu_1) - 1$ total - 0.130. The theoretical R value is 34.43 ± 0.02, in agreement with the experimental value 34.49 ± 0.06.

Microfilm $2.75; Xerox $3.00. 42 pages.

HYPERFINE STRUCTURE IN THE MICROWAVE SPECTRUM OF HDO, HDS, CH_2O, AND CHDO. BEAM MASER SPECTROSCOPY ON ASYMMETRIC TOP MOLECULES.

(Order No. 61-3910)

Patrick Thaddeus, Ph.D.
Columbia University, 1961

Hyperfine structure in the $2_{20} \rightarrow 2_{21}$ rotational transitions of HDO and HDS near 10,278.2 and 11,283.8 Mc/sec respectively, and in the $2_{11} \rightarrow 2_{12}$ transitions of CH_2O and CHDO near 14,488.6 and 16,038.1 Mc/sec has been investigated using a high resolution beam maser microwave spectrometer. Hyperfine coupling constants which have been determined are:

for HDO: $eq(2_{20})Q = eq(2_{21})Q = 79.4 \pm 0.5$ kc/sec,
$C_H(2_{20}) = C_H(2_{21}) = -43.9 \pm 0.3$ kc/sec,
$C_D(2_{20}) = C_D(2_{21}) = -2.03 \pm 0.15$ kc/sec;

for HDS: $eq(2_{20})Q = eq(2_{11})Q = 41.0$ kc/sec,
$C_H(2_{20}) = C_H(2_{21}) = -25.2$ kc/sec,
$C_D(2_{20}) = C_D(2_{21}) = -0.5$ kc/sec;

for CH_2O: $C_H(2_{11}) - C_H(2_{12}) = 2.26 \pm 0.13$ kc/sec,
$C_H(2_{11}) = 0.65 \pm 0.50$ kc/sec,
$\langle 1/r^3 \rangle^{-1/3} = 1.898 \pm 0.017$ A°;

for CHDO: $eV_{\xi\xi}Q = 170 \pm 2.0$ kc/sec,
$C_H(2_{11}) - C_H(2_{12}) = 2.42 \pm 0.5$ kc/sec,
$C_D(2_{11}) - C_D(2_{12}) = 0.25 \pm 0.1$ kc/sec,
$C_H(2_{11}) = 0.20 \pm 1.0$ kc/sec,
$C_D(2_{11}) = 0.13 \pm 0.2$ kc/sec,
$\langle 1/r^3 \rangle^{-1/3} = 1.88 \pm 0.10$ A°.

For HDO, an upper limit of 0.15 has been set on the magnitude of η, the asymmetry parameter of the field gradient tensor about the OD bond.

Microfilm $2.75; Xerox $6.20. 127 pages.

EXPERIMENTAL DETERMINATION OF ABSORBED DOSE FROM X-RAYS NEAR THE INTERFACE OF SOFT TISSUE AND OTHER MATERIAL

(Order No. 61-3477)

Catharine Louise Wingate, Ph.D.
Columbia University, 1961

When cells of soft tissue adjacent to bone, such as osteocytes or marrow cells, are irradiated by x-rays of less than 250 kv, the absorbed dose is substantially higher than that in soft tissue remote from bone for the same exposure dose. A similar effect occurs when tissue culture

cells are irradiated on glass. Experimental measurements of the ratio of absorbed dose to exposure dose near a soft tissue-bone interface and a tissue-glass interface have been made.

The method employed involves measurement of ionization in a gaseous layer using a parallel-plate ionization chamber. One electrode of this chamber is made of muscle equivalent plastic, the other of bone equivalent plastic or glass. One electrode is movable so that the spacing can be varied. The use of either muscle equivalent gas or bone equivalent gas allows determination of the dose rate at very small distances away from the interface in either muscle or bone. The dose rate as a function of distance from the interface is obtained from the slope of the curve of ionization current vs. electrode spacing.

Distribution curves of rad/r in the region of interest (less than 50 microns) about a bone-muscle interface are given for x-ray potentials of 30, 50, 140, and 210 kv. For the same four x-ray beams, curves of average rad/r in a soft tissue layer between two bone layers are given as a function of tissue thickness up to 25 microns. For the tissue-glass interface, curves of the relative increase in absorbed dose in muscle attributed to glass backing vs. tissue thickness are shown for x-ray tube potentials of 50, 140, 210, and 230 kv. Comparison of the experimental results with calculated values and biological studies of other workers are made where possible. The measured values of absorbed dose from x-rays near an interface, presented for the first time in this paper, confirm the validity of the calculations and cover a wider range of practical situations than do prior biological studies.

Microfilm $2.75; Xerox $4.00. 71 pages.

PHYSICS, ELECTRONICS AND ELECTRICITY

A SOLID-STATE MASER USED AS A PREAMPLIFIER FOR A RADIOMETER AND THE OBSERVATION OF CENTIMETER WAVELENGTH RADIATION FROM ASTRONOMICAL OBJECTS

(Order No. 61-3414)

Leonard Erwin Alsop, Ph.D.
Columbia University, 1961

A solid state maser amplifier has been successfully used as a preamplifier for a 3 cm wavelength radiometer. The addition of the maser amplifier has improved the sensitivity of the radiometer by a factor of about twelve over that of the radiometer without the maser. With a 5.5 mc bandwidth and a 5 second time constant, the fluctuation level of the output trace from the radiometer was reduced from 0.5° K to 0.04° K.

The maser amplifier had an input noise temperature of about 85° of which 20° was due to ground radiation into the antenna side lobes. The remaining noise was mainly due to radiation from microwave components preceding the maser. In this dissertation the observed sensitivity is compared with that to be expected on the basis of basic maser and radiometer theory, and shown to be in good agreement with the theoretical value.

The maser used the first three levels of the paramagnetic Cr^{+3} ion in synthetic ruby to provide amplification in accordance with the three level scheme of Bloembergen. Standard klystron powers of about 30 m.watts at frequencies in the range of 22 to 25 Kmc were sufficient to saturate the first and third levels. As a result of the saturation, the second level had a smaller population than the third level, and a signal with a wavelength of 3 cm was amplified by stimulated emission.

The maser radiometer combination was used in conjunction with the 50 foot parabolic reflector of the United States Naval Research Laboratory, which also supplied the radiometer used, to measure the flux densities of five radio sources for the first time at 3 cm. The sources observed were Virgo A, NGC 6357, M8, M20, and IAU 16NOA. The flux densities obtained are compared with the densities previously measured at lower frequencies. A rate of fall off in flux density which is inversely proportional to frequency is indicated for four of the sources. The flux density of the fifth, M8, does not decrease as rapidly as that of the others with increasing frequency.

In addition, an attempt was made to observe three planetary nebulae NGC 6853, the Dumbbell Nebula, NGC 7009, the Saturn Nebula, and NGC 7293, the Helix Nebula. Despite the twelvefold increase in sensitivity of the maser radiometer combination, it was still not possible to observe these nebulae. On the basis of the trace fluctuation levels observed during these attempts, it is possible to assign upper limits of 0.14° K, 0.08° K, and 0.07° K to the antenna temperatures of Dumbbell, Saturn, and Helix, respectively. These upper limits are defined as the minimum antenna temperatures which would have a probability of 99 percent of being detected. Assuming electron temperatures in the nebulae NGC 6853 and NGC 7293 of 10,000° K, upper limits for the electron densities of 800 cm^{-3} and 100 cm^{-3} are obtained. The upper limit for NGC 7009 is higher by a factor of 7 than the value of 0.12° K indicated by optical data. Comparison is made with the values indicated by optical data, which at least in the case of NGC 7293 are contradictory. The effects of density fluctuation in the nebulae and the presence in the nebulae of the $2^2S_{1/2} \rightarrow 2^2P_{3/2}$ absorption line of hydrogen on radio measurements at 3 cm are considered. The latter effect is shown to be unimportant, but the former may cause discrepancies between optical and radio data.

Microfilm $2.75; Xerox $5.60. 111 pages.

FIELD EMISSION CURRENT FROM SILICON AS A FUNCTION OF APPLIED POTENTIAL

(Order No. 61-3935)

Richard Lee Perry, Ph.D.
Oregon State University, 1961

Major Professor: James J. Brady

The field emission projection microscope has been used to study the field emission characteristics of several silicon cold cathodes. The current-voltage data from nine

of these field emitter tips were reduced to the more fundamental current density - electric field values after the tips were examined in an electron microscope. Attempts were made to fit Stratton's theory to the data from five of these tips, with fairly reasonable values obtained in four cases.

Two distinct forms have been found for the relationship between the field-emitted current I (amperes) and the applied voltage V (volts) when plotted as $\log_{10} I$ versus $10^4/V$. The dc relationship for "type 1" emission is "nonlinear" while that for "type 2" emission is nearly straight with only a slight upward curvature. In cases where type 2 emission was obtained, very strongly p-type layers had formed on the silicon surface, causing the whole emitter tip to be strongly p-type, while the surface of a field emitter yielding type 1 emission was much less strongly p-type.

Other results include the following. A dependence of the field emitted current on the temperature of the silicon tip has been observed which is much more pronounced for tips yielding type 1 data than for those yielding type 2 data. Migration and build-up of the silicon tip has also been observed in which the initial changes occur on the edges of the planes, while the final result is the build-up of the {110} planes into ridges. Analysis of a field emission pattern with a grain boundary trace showed that the trace corresponded to the intersection of a $(12\bar{1})$ plane with the emitting surface of the tip.

A brief review of the history and theory of field emission from semiconductors is given. The details of tip fabrication, tube fabrication, the evacuation process, cleaning silicon tips in vacuum, and calculations of the geometrical β factor are included.

Microfilm $2.75; Xerox $9.25. 203 pages.

PHYSICS, METEOROLOGY

EXTENSION OF A THEORY OF LONG WAVES ON A BAROCLINIC WESTERLY CURRENT

(Order No. 61-3642)

William H. Long, Ph.D.
The Florida State University, 1961

An extension of a simplified, quasi-geostrophic, baroclinic theory of long waves set forth by Hess [3] is presented in this investigation. The ramifications of the stability aspects of the model and the results of adding a form of y-dependence to the system are examined. Finally, a steady state, adiabatic energy equation is added to the model as a diagnostic tool for specifying vertical profiles of the basic westerly current U (p) as a function of the parameters of the problems and as a function of particular vertical temperature profiles. Profiles U (p) for the model proposed by Hess [3] are obtained and investigated as to their physical realism. The analogous profiles for the y-dependent case are not explicitly set forth due to mathematical difficulties. However, their general form is discussed in the light of the prior results of the investigation.

The theory is a linear one which is characterized by the standard perturbation approach. The baroclinicity of the system is manifest in the speed shear of a geostrophic basic current U (p). Furthermore, the geostrophic postulate is reflected in the treatment of the term $f(\zeta - \zeta_g)$ which appears in the basic set of equations. This system consists of the three perturbation divergence, vorticity and continuity equations in the variables u, v and ω with U (p), β, f, and the north-south and east-west have numbers λ and μ treated as parameters of the problem.

The baroclinicity of the model manifests itself in the relationship of the pressure dependent amplitude factors to the vertical profile U (p). It is not reflected in the stability aspects of the solutions. Hence the model describes the behavior of a particular class of neutral waves. The structure of these waves, with particular emphasis upon the relationship of the amplitude factor of ω to U (p), is the primary result of this investigation.

Microfilm $2.75; Xerox $3.80. 68 pages.

PHYSICS, NUCLEAR

THE L AUGER SPECTRUM OF CESIUM-137 — BARIUM-137

(Order No. 61-3594)

Audley Oliver Burford, Ph.D.
Vanderbilt University, 1961

Supervisor: S. K. Haynes

The useful low energy limit of the Vanderbilt beta-ray spectrometer has been extended to 2 kev by several modifications to the instrument. A new amplifier and null motor of increased sensitivity were installed in the control circuit, and the filter for removal of AC ripple in the generator output was relocated so that the lens coil current was filtered before the error signal was taken from the loop. Measurements showed that these changes reduced current fluctuations to one part in 1000. Addition of new oil diffusion pumps to the vacuum chamber pumping system resulted in a static pressure of approximately 4×10^{-6} mm Hg, which represented an improvement by a factor of ten.

A side window Geiger counter was designed and constructed for detection of low energy electrons with 100 per cent efficiency. Tests indicated that the counter operated satisfactorily with gas pressures from 1.25 cm Hg to 4.0 cm Hg and that there was no energy dependence in the counter efficiency for electrons above 2.5 kev energy.

Techniques were developed which made possible the routine preparation of collodion counter windows sufficiently thin to be 100 per cent transparent to 2 kev electrons. Ultimately 3 μg cm^{-2} windows which could be used for 8 to 16 hours with a spectrometer pressure below 10^{-4} mm Hg were made with 40 per cent success; 4 μg cm^{-2} windows usable for 12 to 24 hours were made with 60 per cent success. It was found that a 4.8 μg cm^{-2} window was completely transparent to electrons of energies down to 1.7 ± 0.3 kev while 6 μg cm^{-2} windows would transmit 100 per cent of electrons above 3.2 ± 0.2 kev.

The L Auger spectrum of Cs^{137}-Ba^{137} and the conversion electron lines of the 662 kev gamma ray of Ba^{137} have been measured with 3.2 per cent momentum resolution. The mean L fluorescence yield ($\bar{w}_L$) of barium was calculated from these data and a value of 0.248 was obtained. Because this value was in obvious disagreement with $\bar{w}_L$ = 0.148 for barium interpolated from the X-ray measurements of Lay[1] and $\bar{w}_L$ = 0.10 for xenon obtained from Fink and Robinson,[2] the Auger intensities measured in this work were assumed to be too low. Based on the slope of the Lay measurements normalized to the xenon value the fluorescence yield for barium was found to be 0.116, and the experimental Auger intensities were increased to give that value. The following values consistent with the corrected experimental results and the few values for L subshell fluorescence yields available from existing literature were calculated:

$$a_1 = 0.28 \pm 0.06 ,$$

$$0.52 \pm 0.14 \leq a_2 \leq 0.74 \pm 0.16 ,$$

$$a_3 = 0.95 \pm 0.01 ,$$

$$f_{12} + f_{13} = 0.66 \pm 0.07 ,$$

$$0.16 \pm 0.16 \leq f_{23} \leq 0.38 \pm 0.14 ,$$

where $A_i = L_i$ subshell Auger yield and f_{ij} = probability for transfer of vacancy from L_i subshell to L_j subshell.

The values for a_1 and $f_{12} + f_{13}$ represent the most accurate results of this work and a_3 is definitively determined within the accuracy with which w_3 is known. That the various Coster-Kronig transition probabilities are of the magnitudes which were found in this work indicates without question the importance of transitions of the type L-LN when they are energetically possible. In the past these transitions have generally been considered to be negligible.

1. H. Lay, Z. Physik 91, 533(1934).
2. R. W. Fink and B. L. Robinson, Phys. Rev. 98, 1293(1955).

Microfilm $2.75; Xerox $4.40. 85 pages.

THE PRODUCTION AND INTERACTION OF STRANGE PARTICLES PRODUCED BY 1.0-1.1 Bev π^- MESONS IN A XENON BUBBLE CHAMBER

(Order No. Mic 61-1726)

Raphael Aaron Burnstein, Ph.D.
University of Michigan, 1961

The purposes of this study were:

(1) To measure the absolute cross sections for various strange particle production reactions in xenon

(2) To present corrected momentum and angular distributions of the strange particles as observed in the laboratory

(3) To observe the interactions of neutral K mesons which resulted in hyperon production.

This investigation made use of a xenon bubble chamber as the charged particle detector. In addition to identifying events, other parameters necessary for a cross-section determination were measured. The associated production of two strange particles was required for the identification of an event. This eliminated possible background effects.

At a negative pion kinetic energy of approximately 1.0 billion electron volts $4.6 \pm 0.5 \times 10^6$ centimeters of pion track were scanned. Thirty-nine uncorrected events were observed where a lambda hyperon and neutral K meson were produced and both observed to decay in the charged mode. Corrections are given. The cross section for the production of lambda and neutral K mesons was 7 ± 1 millibarns (per xenon nucleus). In addition, results for other reactions are presented. At a negative pion kinetic energy of approximately 1.1 billion electron volts $5.5 \pm 0.5 \times 10^6$ centimeters of pion track were scanned. Seventy-two uncorrected events of the same lambda, neutral K reaction were found. Corrections are given. The cross section for the production of lambda and neutral K mesons was 13 ± 2 millibarns (per xenon nucleus) at this higher beam energy. Corrected momentum and angular distributions based on fifty-seven uncorrected events of the same reaction at the lower beam energy are given. The corrected distributions are given for ninety-three uncorrected events of the same reaction at the higher beam energy.

Nine examples were found of a neutral K meson interacting in the bubble chamber to produce a lambda which decayed in the charged mode. Associated with the production of the original K° was a lambda. The total number and spatial distribution of these events was studied.

Microfilm $2.75; Xerox $6.40. 134 pages.

PHOTONUCLEAR ACTIVATION BY 20 MEV GAMMA RAYS

(Order No. 61-3498)

Walter DelBianco, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. William E. Stephens

The photonuclear activation cross section of elements whose (γ,n) reaction leads to a suitable positron activity has been measured using monochromatic gamma rays from $H^3(p,\gamma)He^4$ reaction.

The gamma rays were monitored by a large sodium iodide crystal whose response curve to the γ rays was measured. The absorption coefficient of these photons in NaI was determined by a good geometry transmission experiment.

The positron activity was determined by a coincidence detector, consisting of two 5" diameter by 2" long NaI crystals set on the annihilation radiation photopeaks. This detector was calibrated against a F^{18} positron source, standardized in a 2π flow counter.

The $C^{12}(\gamma,n)C^{11}$ and $F^{19}(\gamma,n)F^{18}$ reactions were investigated over the energy range from 20.1 to 21.2 Mev. Structure, although reported by other experimenters, was not observed. The (γ,n) activation cross section has been

measured at 20.5 Mev for Cr^{50}, Fe^{54}, Cu^{63}, Zn^{64}, Mo^{92}, Sb^{121}, Pr^{141}, and the results compared with those obtained with betatron experiments.

Microfilm $2.75; Xerox $7.60. 161 pages.

GAMMA-GAMMA DIRECTIONAL CORRELATION IN MAGNESIUM-24

(Order No. 61-3922)

Dale William Glasgow, Ph.D.
Oregon State University, 1961

Major Professor: Larry Schecter

The directional correlation between the 1.368- and 2.75-Mev gamma rays of Mg^{24} was measured at ten angles between 90 and 180 degrees in ten-degree increments using a scintillation spectrometer. The spectrometer which used NaI crystals, differential pulse height analysis and standard coincidence techniques was tested on the two cascade gamma rays of Ni^{60} with satisfactory agreement with published results and the predictions of theory. Na^{24} which decays by beta emission to Mg^{24} was produced by the reaction $Na^{23}(d,p)Na^{24}$ in the 37-inch cyclotron at Oregon State University. The experimental results strengthen the assignment of (2+) and (4+) to the first and second excited states of Mg^{24}, and show that there can be at most 0.003 per cent M3 radiation mixed with the almost pure E2 radiation of the 2.75-Mev gamma ray.

Microfilm $2.75; Xerox $4.40. 83 pages.

DETERMINATION OF THE Λ° DECAY PARAMETER, α.

(Order No. Mic 61-1825)

James Dyke van Putten, Jr., Ph.D.
University of Michigan, 1961

With the observation of parity non-conservation in the decay of the lambda hyperon, the values of the decay parameters assume great importance. The parameter, α, is a measure of parity non-conservation in the decay. α is defined in terms of the complex amplitudes of the S and P orbital angular momentum waves in the decay:

$$\alpha = \frac{2\mathrm{Re}S^*P}{S^*S+P^*P} .$$

The purpose of this study is to measure α.

The decay mode of the lambda hyperon,

$$\Lambda^\circ \rightarrow p + \pi^- ,$$

was observed in a xenon bubble chamber. α was determined from the asymmetric scattering of the decay protons by xenon nuclei.

741 lambda decays were observed. There were 113 nuclear scatterings. From this sample, α is found to be negative with a probability of 77%. The large error in the result is attributed to a.) the inclusion of inelastic scatterings in the scattering sample, and b.) the large errors in determining the scattering plane due to multiple scattering. A proposal for a new experiment in a propane bubble chamber is included.

Microfilm $2.75; Xerox $4.40. 84 pages.

PHYSICS, SOLID STATE

MICROWAVE CROSS-RELAXATION MASERS

(Order No. 61-3767)

Frank Robert Arams, D.E.E.
Polytechnic Institute of Brooklyn, 1961

Adviser: Professor Milton Birnbaum

Three new methods of operating solid-state microwave masers are reported. In each case, experimental data is given and an analysis is presented in terms of the harmonic spin-coupling and cross-relaxation mechanism.

1. Spin-Coupled Pump Transition: Methods using harmonic spin-coupling for operating masers with signal frequencies higher than the pump frequency are presented and analyzed. Expressions for the population inversion ratios are derived, and the maximum signal-to-pump-frequency ratios are calculated.

Experimental data is presented on a ruby maser which was successfully operated using the symmetrical method. Amplification was obtained for $\theta = 90°$ at 4.2°K at signal frequencies from 10,320 to 10,740 Mc, using pump frequencies ranging from 9580 to 9670 Mc. Data on the asymmetrical method is also given.

An experiment is described in which maser operation is obtained simultaneously at two frequencies.

2. Spin-Coupled Idler Transition: Using a maser material with four energy levels, the role of the usual signal and idler transition have been interchanged by the spin-coupling of the idler to another transition harmonically-related in frequency. The rate equations are solved, the population inversion ratios are derived, and the minimum pump-to-signal-frequency ratios are calculated. It is found that the minimum pump-to-signal-frequency is 1.5 in this case, instead of the 2.0 for the standard three-level maser of Bloembergen.

Experimental data is presented on a ruby maser which was successfully operated by this method. Amplification was obtained for $\theta = 32°$ at 4.2°K at signal frequencies from 8820 to 9660 Mc, using pump frequencies from 10,630 to 10,850 Mc.

Measurements of spin-lattice-relaxation times are described.

3. Spin-Coupling in the Wings (Off-Resonance Pumping): A systematic investigation has been made of the relationship between population inversion and pump frequency in ruby. It was possible to achieve strong maser action by pumping in the far wing of the pump transition as much as 1400 Mc (23 linewidths) from its center frequency. Several anomalous inversion peaks were observed. For a signal frequency of 1055 Mc, population inversion was maintained for a pump frequency variation of 2500 Mc at 4.2°K. Signal frequencies from 800 to

3400 Mc, and pump frequencies from 8300 to 13,725 Mc were investigated.

The fit between the experimental points and anomalous lines corresponding to the sum of the frequencies of two other transitions is excellent. An explanation is given in terms of cross-relaxation and an analysis is presented which gives expressions in semi-quantitative agreement with the measurements.

Microfilm $2.75; Xerox $5.80. 116 pages.

THE INFRARED SPECTRA OF THE AZIDE ION IN ALKALI HALIDE MATRICES

(Order No. 61-3479)

James Irvin Bryant, Ph.D.
Howard University, 1961

Chairman: George C. Turrell

Infrared spectra of the azide ion in KCl, KBr, KI and NaCl matrices have been observed from 4000 to 400 cm^{-1} using Perkin-Elmer Models 21 and 112. A comparison has been made of the spectra of samples grown from aqueous solutions with those prepared by the pressed disk technique. Particular attention has been paid to the dependence of the vibrational frequencies on the nature of the matrix and the temperature.

Various contributions to the interionic potential function have been considered in relation to the observed shifts. It is concluded that the studies of vibrational frequency variations of an "impurity" ion in a lattice provide a useful method of measuring interionic forces.

This study illustrates the complex roles of the various contributions to interionic potential functions and emphasizes the inadequacy of the usual oversimplified arguments concerning the effects of the repulsive and attractive parts of the perturbing potential on the vibrational frequencies of an impurity ion in a lattice.

Microfilm $2.75; Xerox $5.00. 96 pages.

ALTERNANT ORBITALS IN CRYSTALS

(Order No. 61-3759)

George Dermit, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Hellmut J. Juretschke

The correlation error of doubly-occupied orbital, single determinant functions can be lowered by introducing into the system a form of singly-occupied orbitals indicating the possible existence of a general spin alignment in crystals. The effects of spin coupling and correlation energy can be investigated with the aid of alternant orbitals which are localized on alternate sets of atoms belonging to two equivalent sublattices of the crystal. Each doubly-occupied orbital is split into two orbitals, one with minus and the other with plus spin. The overlap of these two sets of orbitals can be changed with the aid of a parameter A, which gives the orbitals a semi-localized character leading for A = 1 to doubly occupied orbitals and for A = 0, to pairs of singly occupied orbitals.

The alternant orbital state can be formulated both in terms of semi-localized AO's or in terms of semilocalized MO's, which transform into each other under a unitary transformation, provided both sets are constructed from the same basic set of orthogonalized AO's. These are the orbitals of free atom states having the same electronic symmetry as the bonding symmetry of the lattice. Since the free atom states having several equivalent electrons obey Hund's rule of complete spin alignment for open shells, the appropriate spin-state for the over-all system in its dissociated state, must also obey the same rule in order to minimize the correlation energy. A certain amount of the spin alignment may also be expected to exist in crystals.

A complete energy expression for a state allowing for spin alignment in terms of alternant orbitals is worked out for molecules having an arbitrary number of electrons and for crystals. The final expression is in terms of the integrals of the basic OAO's, and the alternant parameter A which describes the spin structure of the wave-function. This expression is applied to diamond using existing calculations of Schmid, and the results are compared with a valence-bond state energy. Within the framework of the available approximate integrals no correlation is found.

The desirability of having an accurate set of OAO's and precise estimates of integrals for the investigation of correlation and spin coupling effects in crystals is pointed out. Such integrals would be useful for both the valence-bond as well as the state of spin alignment.

Microfilm $2.75; Xerox $5.40. 107 pages.

GALVANOMAGNETIC EFFECTS AND BAND STRUCTURE OF PURE AND TIN DOPED ANTIMONY CRYSTALS

(Order No. 61-3760)

Seymour Epstein, Ph.D.
Polytechnic Institute of Brooklyn, 1961

Adviser: Hellmut J. Juretschke

Galvanomagnetic effects of pure, 0.2% and 0.8% tin-doped antimony are measured and interpreted in terms of a simple ellipsoidal model of the band structure. Room temperature phenomenologically independent resistivities, Hall coefficients and magnetoresistivities consistent with the symmetry $R\bar{3}M$ of antimony are systematically determined for magnetic fields of 5000 gauss and below from measurements on single crystal square-sectioned rods oriented so that the current flow is either normal or parallel to the principal axis.

The band model assumes a set of three mobility ellipsoids for the valence and conduction band. Each set has a certain carrier density and the contributions to the galvanomagnetic effects are described by specifying three principal mobilities and an angle of tilt around a binary ellipsoid axis. Explicit interband scattering is neglected and intraellipsoid scattering is represented by an isotropic

relaxation time. The phenomenological coefficients--none of which the model requires to be identically zero--are formally obtained by adding the contributions from the hole and electron ellipsoids.

Our analyses show (1) for pure antimony a well-defined set of hole mobility ellipsoids (essentially the same as that independently obtained from similar experiments and consistent with de Haas-van Alphen energy ellipsoids) and two possible sets of electron mobility ellipsoids, and (2) that the alloy data can be scaled from the pure antimony ellipsoids by assuming that, on alloying, the hole density increases, the electron density decreases, while the hole and electron mobilities, respectively, decrease proportionally and do not change. On adding 0.8% Sn, we find the hole density to increase to $10 \cdot 10^{19}/cm^3$ and the electron density to decrease to $2 \cdot 10^{19}/cm^3$ from $4.3 \cdot 10^{19}/cm^3$, or a hole contribution per tin atom of .3 .

Assuming the published de Haas-van Alphen hole effective masses and our pure antimony hole density of $4.3 \cdot 10^{19}/cm^3$, we obtain a hole Fermi energy of .12 ev. If the assumed hole masses and band overlap do not change on alloying, the hole density of states turns out to be about three times the electron density of states and the electron Fermi energy is .29 ev.; for the .8% alloy the Fermi energies change by .11 ev. The calculation also obtains that about 2% Sn is required to remove the electron overlap and $7 \cdot 10^{19}$ electrons/cm^3 are needed to fill the hole band.

The existence of scaling solutions is consistent with an isotropic scattering relaxation time assumed in the model; the existence of nonscaling solutions from which changes in the band structure may be deduced has not been ruled out. Microfilm $2.75; Xerox $5.60. 113 pages.

STRESS AND STRESS ANISOTROPY IN IRON FILMS

(Order No. 61-3301)

Joel Dean Finegan, Ph.D.
Case Institute of Technology, 1961

Measurements were made of the angle of incidence and thickness dependence of the stress anisotropy and stress in iron films. The angle of incidence was varied from 0° to 36.5° in films of a nominal thickness of about 650A. The ratio of the minimum stress to maximum stress varied from 1 for normal incidence to about .85 for a 36.5° angle. The direction of maximum stress was normal to the plane of incidence of the depositing atoms. At an angle of incidence of 36.5° the film thickness was varied from 216A to 1033A. The stress ratio decreased from .94 at 216A to about .84 at 700A and then increased to .89 at 1033A. The stress of about 10^{10} $\frac{dynes}{cm^2}$ decreased with increasing thickness except for a narrow and pronounced peak at about 700A.

The essential features are given for an explanation of the stress in terms of the mismatch of the crystallographic structure at grain boundaries.

Microfilm $2.75; Xerox $3.00. 57 pages.

THE SPECIFIC HEAT OF FERRITES AT LIQUID HELIUM TEMPERATURES

(Order No. 61-3545)

Solomon Robert Pollack, Ph.D.
University of Pennsylvania, 1961

Supervisor: K. R. Atkins

The specific heat of lithium, cobalt, magnesium, and nickel ferrite has been measured from 1.8°K to 5°K using a calorimetric technique similar to that used by Clement. A "heat switch" was used to cool the samples rather than a helium exchange gas. In all cases the specific heat C could be described by the relation $C = \alpha_M T^{3/2} + \beta T^3$ where T is the temperature and α_M and β are constants. The Debye temperatures were computed from β and were in good agreement with values obtained at liquid nitrogen temperatures. The $T^{3/2}$ temperature dependence verifies the spin-wave theory for these compounds although the values of α_M were consistently larger than anticipated from observed values of the Curie temperatures. Possible explanations for this are discussed. An extra term proportional to T^{-2} was observed for cobalt ferrite and this was identified as the nuclear contribution to the specific heat. From the magnitude of this term the magnetic field at the nucleus of the cobalt ion was evaluated and found to be approximately 410 koe.

Microfilm $2.75; Xerox $7.40. 156 pages.

CONSIDERATION OF CERTAIN VIBRATIONAL MODES OF POLARIZED MULTI-RESONANT BARIUM TITANATE TRANSDUCERS

(Order No. 61-3396)

Carl Alden Stevens, Ph.D.
Boston University Graduate School, 1961

Major Professor: Dr. Michael W. Rice

A report is made on experimental findings for stimulating various vibrational response modes in polarized barium titanate ceramic plates. An experimental technique was developed for the continuous and automatic recording of such responses. An analytic consideration evolved and a simplified expression for the normal modes of the two-dimensional length-width extensional-compressional family for essentially thin flat plates resulted.

The polarized ceramic plate, with its full-area silver plated major surfaces as electrodes, acts as a one-port network whose driving point admittance is a function of frequency. This functional admittance-frequency relationship, in turn, depends upon the elastic and electric constants of the test sample, the boundary, and the mounting conditions. The thin rectangular transducer can be classified conveniently as an essentially double-stress system since the dynamical behavior is completely described by two components of stress. The change of stress along the thin dimension is considered negligible. The vibrational patterns or modes of motion investigated are the two-dimensional modes for in each of the transducers considered

Poisson coupling effects between the various modes of vibration studied are exhibited.

The second-order electrostrictive equations of state are specialized to apply to transducer systems whose vibrations are purely extensional. The resulting equations are then linearized to approximate the case where vibrations in the system parameters are small compared with the initial values of the parameters. For thin rectangular plates with a linear uniform electric field directed along the thickness; the normal modes are derived as

$$\omega_{mn}^2 = \frac{\pi^2 Y^E}{2\rho(1-\sigma^{E_2})}\left\{\left(\frac{n^2}{\ell_x^2}+\frac{m^2}{\ell_y^2}\right) \mp \left[\left(\frac{n^2}{\ell_x^2}-\frac{m^2}{\ell_y^2}\right)^2 + \frac{4m^2n^2\sigma^{E_2}}{\ell_x^2\,\ell_y^2}\right]^{1/2}\right\}$$

and this serves to define the natural frequencies of the system.

Many of the common types of response modes have been excited in rectangular plates approximately one-half inch along a major side. For square plates, it was found that the frequency of the principal mode (m = n = 1) was essentially independent of the plate thickness. This held for plate thicknesses ranging from less than 5% to greater than 30% the width of the plate.

The observation of node-antinode configurations for thin plates stimulated at high overtone modes was achieved by using a special powder-pattern technique. The experimental and analytical results for the principal mode (m = n = 1) agree to within 4% in the frequency range in which shear and flexural modes are inhibited. The error increases with an increase in eigen values m and n. This is probably due to the perturbation of neighboring shear and flexural modes.

If the plate is perfectly square, that is if $\ell_x = \ell_y$, the above equation yields the following two sets of natural frequencies.

$$\omega'_{nn} = \frac{n\pi}{\ell_x}\left[\frac{Y^E}{\rho(1+\sigma^E)}\right]^{1/2} \text{ and } \omega''_{nn} = \frac{n\pi}{\ell_x}\left[\frac{Y^E}{\rho(1-\sigma^E)}\right]^{1/2}$$

The experimental curve of principal mode frequency vs. plate length for rectangular plates exhibit frequency splitting over certain segments of the dimensioning range. This occurs when the length-width ratio of the plate is favorable to enhance the stimulation of even order flexures along with the principal length-width extensional-compressional mode in the plane of the plate.

Related experiments were conducted in several areas of interest. These included the effect of transverse polarization, preferential electrode configuration, and the testing of vibrational modes for thin flat circular barium titanate ceramic polarized plates. A preliminary study of the response spectrum for thin flat circular plates was carried out and the usual modes of longitudinal thickness, shear, flexural, radial, and twister were recorded.

Microfilm $2.75; Xerox $4.60. 86 pages.

THE ELASTIC CONSTANTS OF LITHIUM-MAGNESIUM ALLOYS

(Order No. 61-3320)

Joseph Trivisonno, Jr., Ph.D.
Case Institute of Technology, 1961

The single crystal elastic constants of dilute lithium-magnesium alloys were measured using the ultrasonic pulse-echo technique. In terms of $d\ell n\, C/dx$, all fundamental elastic constants increase with composition by the following amounts: C_{44}, 1.22; C', 1.03; B_s, 1.2; per atom fraction. Small corrections for lattice parameter change upon alloying were made for C_{44} and C' by using the pressure derivatives of the elastic constants of pure lithium and the known variation of the lattice constant with composition. The remaining effect is ascribed to alloying alone. Both to understand the elastic shear constants of lithium and to comprehend their dependence on composition, one must include small negative stiffness contributions arising in the Fermi energy, in addition to the major and usual electrostatic stiffness. It is then possible to deduce the variation with composition of each contribution from the measured total variation for the two shear constants, with the result that $d\ell n\, C_E/dx = 1.24$ and $d\ell n\, C_F/dx = 1.76$. Both values are reasonable.

Microfilm $2.75; Xerox $3.00. 33 pages.

RESPIRATORY, CIRCULATORY AND METABOLIC ADJUSTMENTS TO PROLONGED DIVING IN THE AMERICAN ALLIGATOR, ALLIGATOR MISSISSIPPIENSIS.

(Order No. 61-3481)

Harald Torbjørn Andersen, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. James D. Hardy

Conspicuous physiological adjustments to experimental submersion have been observed in the natural divers among the birds and the mammals. In order to obtain further information on the phenomena associated with water immersion, and to explore these characteristics in other diving vertebrates, experiments have been carried out on the American alligator, Alligator mississippiensis. The heart rate was found to slow down during diving, in some cases to only 5% of the pre-diving rate. The pressure induced in the large arteries by ventricular systole diminished only gradually during diastole, probably due to an increased peripheral resistance resulting from a marked vasoconstriction in certain vascular beds. This thesis was supported by the fact that lactic acid formed in the muscles during diving did not appear in the blood until after emersion, suggesting that the blood flow through the muscles is greatly reduced while the animals dive. The alligator may recover easily from a submergence lasting until the oxygen stores are almost completely depleted. These results indicate that the diving reflexes occur in a wide variety of vertebrate divers belonging to different phylogenetic groups. They also support the following conclusions:

1. The circulatory adjustments, by shutting off the perfusion to certain vascular beds, enable the alligator to make the limited oxygen stores last throughout prolonged periods of submersion.
2. The animals remain in a state of useful consciousness until their oxygen stores are almost exhausted, thereby assuring a complete utilization of the oxygen available.

Microfilm $2.75; Xerox $5.20. 105 pages.

THE EFFECT OF TRAUMA AND OTHER FACTORS ON BLOOD PROTEOLYTIC ACTIVITY IN RATS

(Order No. 61-3777)

Elizabeth Letitia Beard, Ph.D.
Tulane University, 1961

Chairman: John K. Hampton, Jr.

Blood proteolytic activity is thought to have a well regulated, protective function in mammalian blood vascular systems. In mammalian plasma there is normally present an inactive precursor of the enzyme thought to be responsible for blood proteolytic activity. The precursor is called plasminogen and is capable of being converted to the proteolytically active enzyme, plasmin. The conversion of plasminogen to plasmin is thought to occur in the body as need arises for a repair mechanism, especially as a means of lysing thrombi in circulating blood or fibrin deposits in the blood vascular system.

Normally, mammalian blood registers low levels of proteolytic activity, indicating that only small amounts of plasmin are present. Blood plasmin levels are difficult to assess in that plasma also contains plasmin inhibitors which help to check the blood proteolytic activity levels.

Enhanced blood proteolytic activity is known to be produced by a wide variety of stressful stimuli, such as anxiety, electroshock, ischemia and exercise. The question of the relationship of blood fibrinolytic activity to stress has prompted the experiments in this dissertation. The problem has been to quantitatively relate changes in blood proteolytic activity to different types of traumatic experiences of varying intensity.

Definitive studies were made with rats, of the variation of serum proteolytic activity following rotation in the Noble-Collip Drum. Normal rats and rats which had been made trauma-resistant by subjecting them to gradually increasing drum trauma doses over a three week period were compared in these experiments.

Other definitive studies involved the effect of high fat diets on rat serum proteolytic activity. This problem was suggested by reports that high fat diets inhibit blood proteolytic activity, which may contribute to the deposition of atherosclerotic plaques in vascular walls. Rats were divided into three diet groups: (1) One group received Wayne Lab Blox (normal diet) containing 4.9% fat. (2) A second group was fed a 40% corn oil diet (unsaturated fat). (3) The third group received a 40% butter diet (saturated fat). Following dieting, the serum proteolytic activity of non-traumatized and traumatized members of each diet group was compared. Dieted rats were traumatized so as to reveal by this means of activation of rat serum proteolytic activity any essential differences in plasmin concentrations that might exist between the three diet groups.

Pilot studies were completed on the effect of burn,

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hemorrhage and irradiation on rat serum proteolytic activity. Also in vitro activation of rat serum plasminogen by known activators, such as streptokinase in combination with human serum and tissue cell fractions were undertaken. Plasmin inhibitor destruction by chloroform, and plasmin separations by paper electrophoresis were investigated, in an attempt to more accurately assess true serum plasmin levels. Finally, in vitro plasmin inhibition received attention. Soybean trypsin inhibitor and epsilon amino caproic acid were the plasmin inhibitors studied. Studies of plasmin inhibition were of interest as an indication of later studies of in vivo plasmin control.

Experiments in which rats were subjected to Noble-Collip Drum trauma, showed the serum proteolytic activity to be significantly higher in normal and trauma-resistant rats drummed for at least 240 revolutions, at a rate of 40 R.P.M., than in non-traumatized rats. The level of activity of the drummed rats rose following the administration of increasing trauma doses. Trauma-resistant rats drummed for 240-280 revolutions developed lower serum proteolytic activity levels than did non-adapted rats similarly treated. These results led to the conclusion that trauma causes spontaneous blood proteolytic activation, the extent of which is correlated with the intensity of the trauma. Also, it appears that resistance to trauma may be dependent on the ability of adapted animals to release less plasmin following stressful stimuli.

High fat diet studies did not show significant differences between the blood proteolytic activity of rats fed normal, 40% corn oil or 40% butter diets.

Stressful stimuli, as burn hemorrhage and irradiation, did produce increases in rat serum proteolytic activity in the preliminary experiments reported. Enhancement of rat serum proteolytic activity was obtained following the addition of plasminogen activators, as streptokinase in combination with human serum and tissue cell fractions and paper electrophoretic serum separations. The action of chloroform was inconclusive from our experiment. Effective inhibition of rat serum proteolytic activity was obtained by using soybean trypsin inhibitor and epsilon amino caproic acid.

Microfilm $2.75; Xerox $7.40. 159 pages.

STUDIES CONCERNING ADRENAL CORTICAL FUNCTION IN PREGNANT AND FASTED-PREGNANT SHEEP

(Order No. 61-3659)

William Morris Dickson, Ph.D.
University of Minnesota, 1961

Adviser: Paul B. Hammond

Dysfunction of the adrenal cortex has been suspected as the cause of clinical pregnancy toxemia in the sheep. Other workers have observed that fasting of the pregnant ewe results in a condition which is indistinguishable, with respect to clinical or laboratory signs, from the naturally occurring disease. This study was designed to compare the effect of fasting in normal pregnant ewes with fasting in pregnant ewes treated with 2,2-bis(p-chlorophenyl)-1,1-dichloroethane (DDD). An experiment was also conducted in which the effect of fasting was studied in normal and adrenalectomized pregnant ewes.

The first part of the study was concerned with the development of a simple and rapid quantitative test for the chemical assay of ovine plasma corticosteroids. The technique adopted consisted of; (1) extraction of the plasma with dichloromethane or chloroform (2) redissolving of the dried extract in benzene and partition of the 17 hydroxycorticosteroids into distilled water (3) extraction of the distilled water with chloroform or dichloromethane (4) reaction of the dried extract from the previous step with phenylhydrazine HCl in sulfuric acid-ethanol (Porter-Silber reagent) and (5) measurement of the optical density of the resultant phenylhydrazone to determine the corticosteroid concentration.

In the second part of the study, three experiments were conducted. The first was a factorial type trial in which 20 pregnant ewes were divided into four groups; (a) controls (b) ewes given 4 grams of DDD orally for 9 days previous to lambing (c) ewes fasted for 4 days just prior to term and (d) ewes receiving both of these treatments. In the second experiment, 24 ewes were used, DDD was given intraperitoneally in three 4 gram doses per week for the latter third of gestation, and the food intake was diminished to one-third normal for the latter third of gestation rather than being completely withheld as in the first experiment. At the end of these trials, selected ewes (random within group) were sacrificed and the adrenal glands and liver were examined for gross and microscopic pathology. In the third experiment, 3 adrenalectomized and 3 intact pregnant ewes were completely fasted for periods ranging from 7 to 14 days. At intervals in all experiments, blood glucose, blood total ketone body, and plasma corticoid concentrations were determined.

Briefly, the results of this investigation were as follows:

1. The fasting conditions used in the first two experiments did not appreciably affect the blood glucose, blood ketone, or plasma corticoid concentrations. Apparently, as previously reported, poorly or moderately conditioned pregnant ewes are relatively resistant to fasting ketosis. In the third experiment, typical cases of fasting ketosis were induced in intact pregnant ewes by 7 to 14 days of complete fasting. Even in these cases, the resultant hyperketonemia was mild.

2. The pregnant ewe is not very susceptible to the adrenocorticolytic action of DDD; however, evidence of partial inhibition was obtained.

3. The adrenalectomized pregnant ewe maintains a relatively normal blood glucose concentration for a longer period of time when completely fasted than the intact pregnant animal. In addition, the adrenalectomized ewes did not develop hyperketonemia when fasted.

4. The plasma 17,21 dihydroxycorticosteroid concentrations found in these experiments were not nearly as low as those previously reported. In the first experiment, the mean and standard deviation was 4.66 ± 3.21 μg.% and in the second, 4.15 ± 2.51 μg.% (μg.% = micrograms per 100 milliliters of plasma). Adrenalectomy lowered the plasma corticoid concentration to less than 0.5 μg.%.

5. The major effect of pregnancy on all three blood measurements appeared to be an increase which occurred at, or just before, parturition.

Microfilm $2.75; Xerox $8.60. 189 pages.

THE REGENERATION OF FLAGELLA BY OCHROMONAS DANICA

(Order No. 61-3427)

David Alan Dubnau, Ph.D.
Columbia University, 1961

A method is described of detaching the flagella from Ochromonas danica, and of following the regeneration of flagella with time. These kinetics are found to consist of a well-defined lag period followed by a sudden onset of regeneration at the maximum rate. The regeneration rate thenceforth deccelerates continually. Some investigations into the nature of the lag period are described. Evidence is presented, suggesting that during the lag period, an unstable state is built up within the cell, the presence of which is necessary for the onset of regeneration to occur.

An analysis of the mechanism controlling the regeneration rate is attempted. Evidence is adduced which is consistent with some variety of feedback control, while it tends to mitigate the role of a "critical substance" in controlling the rate of regeneration.

On the basis of inhibitor experiments, it is concluded that energy is utilized throughout the regeneration process.

The role, if any, of protein synthesis in flagellar regeneration is investigated and discussed. A variety of experiments strongly suggest that at least some protein synthesis occurs during flagellar regeneration. This may involve de novo or partially de novo synthesis, and may apply to some or all of the flagellar protein material.

The potentialities of this system for further investigations are briefly evaluated, and a working model of flagellar regeneration is presented.

Microfilm $2.75; Xerox $4.00. 74 pages.

A STUDY OF FACTORS RELATED TO THE FUNCTIONAL IMPAIRMENT RESULTING FROM LOADING THE RUMEN OF CATTLE WITH HIGH CARBOHYDRATE FEEDS

(Order No. 61-3660)

Robert Hugh Dunlop, Ph.D.
University of Minnesota, 1961

Adviser: Paul B. Hammond

The effects of engorgement of cattle on grain were studied. Experimental situations studied included administration of grain into the rumen, loading of the emptied rumen with solutions of lactic acid at various doses, lactate concentrations, hydrogen ion concentrations, and osmotic pressures. Similar studies with respect to lactic acid were conducted in rabbits. Determinations made in the course of these studies included estimation of body fluid spaces, concentrations of hydrogen ion, concentrations of D-lactate and L-lactate, freezing point depression, hematocrit, and electrolyte concentrations. These determinations were in most instances made in both the rumen and the peripheral blood.

Preliminary studies involving eighteen field cases of grain engorgement confirmed the general observations of others. Salient features of the disease included 1.) pronounced fall in blood pH; 2.) rise in blood lactate; 3.) rise in blood lactate/pyruvate ratios; 4.) pronounced dehydration; 5.) high mortality rate; and 6.) persistence of illness beyond this phase in many instances.

It was established that the oral administration of D-, L-lactate to rabbits at a rate of 20 - 50 mM/kg resulted in pronounced dehydration, fall in blood pH, rise in blood lactate and lactate/pyruvate ratios, and death. Osmotic dehydration induced by the oral administration of sodium sulfate cr mannitol resulted in death with lesser rises in blood lactate and lactate/pyruvate ratios and with pronounced but lesser falls in blood pH than was the case in lactic acid poisoning.

Studies concerning the effect of D-, L-lactate administration into the reticulo-rumen indicated that the presence of a normal ruminal microflora resulted in rapid metabolism of large doses of administered lactate. Low ruminal pH with or without the presence of ruminal ingesta favored the absorption of D-, L-lactate from the rumen. It was also established that L-lactate was much more rapidly cleared from the blood than was D-lactate when a mixture of the two isomers was injected intravenously. The rate of disappearance of the two isomers from the reticulo-rumen was similar when the mixture was placed into the rumen.

The clinical signs of engorgement and the associated biochemical changes previously described could be reproduced by the administration of mannitol and lactic acid in a calf, but not by the administration of lactic acid alone in an even larger dose and concentration. Mannitol dehydration alone resulted in pronounced fall in blood pH, rise in blood lactate, rise in lactate/pyruvate ratio, but not in death. Microfilm $4.45; Xerox $15.75. 346 pages.

ION TRANSPORT BY FROG GASTRIC MUCOSA

(Order No. 61-3511)

John Gaetano Forte, Ph.D.
University of Pennsylvania, 1961

Supervisor: Robert E. Davies

The frog gastric mucosa secretes hydrochloric acid and maintains an electrical potential for many hours after isolation. These processes involve the secretion of ions by the mucosa and are dependent upon the oxidative metabolism of the tissue. The oxygen requirements of gastric secretion were previously studied, but the measurements were not carried out under optimal conditions for the tissue, in that oxygen consumption was determined in the absence of external CO_2 and chloride transport was not measured directly.

Bullfrog gastric mucosa, Rana catesbiana, was suspended

between two Plexiglass chambers and the mucosa was bathed with Ringers solution equilibrated with 95% O_2 and 5% CO_2. The transmucosal potential, short-circuit current and membrane conductance were measured. Oxygen concentration in the bathing solution was determined polarographically, which permitted the measurement of oxygen consumption with CO_2 present. Chloride-36 was used to measure unidirectional fluxes of chloride, and hydrogen ion secretion was determined by the pH stat method. In studies on the specificity of chloride transport the chloride in the bathing solution was completely replaced by other anions.

Many values of the ratio of chloride ions transported to total oxygen molecules consumed by the gastric mucosa exceeded 4.0, indicating that more electrons were required in chloride transport than could be accounted for by the reduction of oxygen. These results invalidate a simple redox theory of chloride transport by gastric mucosa according to which no more than four univalent ions can be transported per oxygen molecule consumed.

Anaerobiosis decreased the short-circuit current to 0 to 10% of the value obtained aerobically. The nutrient to secretory flux of chloride decreased while the secretory to nutrient flux increased, the net flux becoming zero.

When nitrate, bromide, iodide, thiocyanate, or thiosulfate completely replaced chloride in the bathing solution, a short-circuit current similar to that found in Ringers solution was maintained for several hours, which indicated that these ions could substitute for chloride in the anion transport mechanism of the gastric mucosa. The secretion of hydrobromic acid and nitric acid by the mucosa when bromide and nitrate completely replaced chloride was clearly demonstrated.

Ethylenediamine tetraacetic acid (4 mM) decreased the electrical resistance of the mucosa without appreciably affecting the short-circuit current. Both unidirectional fluxes of chloride-36 increased, but the net flux remained the same, thus supporting the hypothesis that some firmly bound calcium (or magnesium) contributes to the permeability characteristics of the membrane.

The results of these experiments were considered in relation to a comprehensive theory of ion transport involving an electron cycle mechanism where chloride could be transported by a phosphopyridine nucleotide or a Fe^{++}, Fe^{+++} system driven by a hydrogen pump.

Microfilm $2.75; Xerox $6.20. 130 pages.

EFFECTS OF DIETARY MODIFICATIONS, HEAT AND PROCESSING ON THE GOITROGENIC PROPERTY OF SOYBEANS.

(Order No. 61-3460)

Frederic William Nordsiek, Ph.D.
Columbia University, 1961

The goitrogenic property of raw soybeans was confirmed by feeding beans of mixed commercial varieties, or of the Hawkeye variety, to male albino rats of the Sprague-Dawley strain, for 7 weeks starting at the time of weaning. The soybean diets fed provided complete vitamin and mineral requirements, except that they contained less iodine than the requirement of the rat; but that the soybean goitrogenic effect is a positive property was clear because the goiters in rats fed soybean diets were significantly larger than those in rats fed a control diet containing even less iodine, but no soybeans.

Dietary level of soybeans fed was found to affect the goitrogenic response markedly. Thus diets containing 60% of raw soybeans caused significant increases in both fresh and dry weights of the thyroid glands, whereas a diet containing 35% of raw soybeans caused a significant increase only in the dry weight of the glands.

Adding iodide to a diet containing 60% of raw soybeans, to provide the minimum iodine requirement of the rat taken as 0.3 ppm of iodine in the diet, obliterated the goitrogenic effect as measured by fresh weights of the thyroid glands, but not as measured by the dry weights of the glands. The goitrogenic action of the soybean was completely obliterated by autoclaving the beans for one, two or three hours at 120° C, or by extracting the beans with commercial hexane involving heating at 75° C for 30 minutes, or by this extraction treatment plus heating for 25 minutes at 110° C.

Improving the protein quality of diets containing raw soybeans, by adding casein, whole corn, or methionine, reduced their goitrogenic properties. The dry weights of the thyroid glands were more sensitive than the fresh weights of the glands to the effects of such dietary alterations.

Mean fresh thyroid weights of groups of 6 to 10 rats fed various raw, processed or modified soybean diets, or a low iodine control diet without soybeans, showed a negative correlation with mean iodine contents of the thyroid glands expressed as per cent of dry weight. Mean per cent of dry matter in the thyroid glands showed a positive correlation with per cent of iodine in the glands, dry basis. Hence mean weight of dry matter in the thyroid glands, which had appeared as the most sensitive criterion of both goitrogenesis and antigoitrogenesis throughout the study, showed no clear relationship with iodine content of the thyroid glands, dry basis. These relationships, viewed against the background of the other findings of the study as well as of published studies, suggest that the mechanism of action of soybean goitrogenesis is not wholly, although it may be in part, interference with iodine uptake by the thyroid gland.

While developing a control diet for this study, it was discovered that a low iodine diet, without soybeans, containing 40% of dried brewers type yeast, had a goitrogenic effect. In contrast to heretofore standard low iodine goitrogenic diets, this one produces good growth in the rat, and therefore may provide a long sought experimental tool.

Microfilm $2.75; Xerox $5.00. 100 pages.

THE TRANSPORT OF FAT IN MAN: A STUDY OF CHYLOMICRONS.

(Order No. Mic 61-1850)

Malcolm Lee Peterson, Ph.D.
The Rockefeller Institute, 1960

These studies have been designed to examine the events by which the human organism converts non-polar substances, dietary fats, into a form suitable for transport through an aqueous medium. The investigation has been

reported in two units. In the first part the chemical nature of dietary fats and chyle fats have been compared. This was made possible by study of patients with chyluria. This lesion permitted the collection of large amounts of fat at the very first stage of its intravascular transport. By feeding chemically defined fats and determining the nature of the fats in the chyle, it was possible to gain insight into the processing of dietary fat prior to its passage into the blood.

In the second part of the studies the chemical structure of the chylomicron, the intravascular form of the dietary fat, was examined. The condition of chyluria provided an opportunity to compare the freshly constituted chylomicrons of chyle with those of the serum during normal alimentary lipemia. In addition, patients with elevated serum triglyceride levels furnished the opportunity to examine chylomicrons present in states of abnormal lipemia in the light of the knowledge of normal chylomicrons.

It was shown that the fatty acid composition of the chylomicrons under most conditions is almost precisely that of the dietary fat. However, hydroperoxides of the unsaturated fatty acids in the dietary fat could not be demonstrated in the lipids of chyle. Short or intermediate chain-length fatty acids (C_8-C_{14}) in the dietary fat were somehow selectively removed and not transported as chylomicrons. In fact, when caprylic and capric acids (C_8 and C_{10}) were the sole dietary fat, no chyle chylomicrons were produced, and an intermediate chain-length acid, myristic acid (C_{14}) was transported in chylomicrons to only two-thirds the extent that oleic acid (C_{18}) was. Based on previous animal studies, it can be assumed that the portal vein was the route of transport of the shorter chain fatty acids. Because these shorter acids were not found as the predominant acids in the chyle non-esterified fatty acids, it was inferred that short chain acids were transported into the portal vein in the esterified form.

The distribution of fatty acids among triglyceride molecules was shown to be greatly altered in the course of absorption. Experiments with fats having a known glyceride distribution showed that extensive rearrangement of fatty acids occurred during absorption, but the re-esterification was not strictly random. After two simple triglycerides (trimyristin and triolein) were fed, the triglycerides in the chyle were mostly mixed triglycerides (dimyristylolein and dioleylmyristin), indicating that hydrolysis must have been almost complete. The 2:1 ratio of trimyristin to triolein in the chyle lipids after feeding equivalent amounts of each of the two acids suggested the operation of a selective process during triglyceride resynthesis.

The examination of the chemical structure of chylomicrons revealed that the serum and chyle chylomicrons have the same composition. The relative amounts of cholesterol esters and phospholipids in the chylomicron were seen to be quite constant when a variety of fats, chiefly triglyceride, were fed, but an increased cholesterol content was noted when phospholipids were part of the dietary fat. The fatty acid compositions of the phospholipids and cholesterol esters were affected by the dietary fat, but they also contained large amounts of non-dietary fatty acids. The contribution to the total chylomicron fatty acids by these two ester classes was slight compared to that of the triglycerides.

Having thus described the structure of the normal chylomicron derived from exogenous sources, the chylomicrons of patients with hyperlipemia were similarly analyzed. It was shown that a patient with creamy serum, despite a fat-free diet for six weeks, had chylomicrons with the same proportion of lipid esters as normal chylomicrons, but with a fatty acid pattern which resembled that of human adipose tissue.

The chylomicron fatty acids of another hyperlipemic patient were found to incorporate the fatty acids of a dietary fat (corn oil) rapidly, but in contrast to the normal situation, the dietary fatty acids were diluted in the chylomicrons by large amounts of endogenous fatty acids. After establishing levels of constant amounts of fatty acids in the chylomicrons from the two sources, the corn oil was removed from the patient's diet and corn oil fatty acids disappeared from the chylomicrons. From the rate of disappearance of linoleic acid, an estimation of chylomicron half-life suggested that the abnormal triglyceridemia in this instance was possibly related to a delay in the clearance of chylomicrons from the circulation.

The protein of the chylomicrons from these different sources was examined. The amount of protein usually ascribed to the chylomicron was lowered continuously by repeated washing, and the protein material isolated after such washings was shown to contain a number of serum proteins. Thus further proof of its contribution to chylomicron structure is necessary before the protein fraction can be assigned the role of carrier and stabilizer.

Microfilm $2.75; Xerox $5.60. 113 pages.

EXTRACELLULAR ENZYME PRODUCTION IN TETRAHYMENA PYRIFORMIS

(Order No. 61-3905)

Issar Burtan Smith, Ph.D.
Columbia University, 1961

It has been reported previously that Tetrahymena pyriformis releases a protease into its culture medium. The work reported here has demonstrated the physiological nature of this release and also revealed the presence of several other extracellular enzymes.

The protease was released throughout the growth cycle, on all media tested, in amounts proportional to cell number. The presence of dinitrophenol or the absence of exogenous amino acids prevented the release of the enzyme.

Analogs, chloramphenicol and starvation for nucleic acid precursors or specific amino acids were unable to stop protease release, even though increases in cellular protein were immediately halted. This evidence for the involvement of an intracellular protease pool is made more suggestive by differential centrifugation data which indicated that up to 70% of the cell's protease was localized on or near the cell surface.

It was found that Tetrahymena released RNase, DNase, alkaline phosphatase and α-amylase, when grown in a crude proteose peptone medium.

The release of the α-amylase was continuous throughout growth. This enzyme was purified by conventional ammonium sulfate and acetone fractionation, and some of its physical and biochemical properties were studied. Differences between the external amylase and an internal amylase, in substrate profile and chromatographic behavior, suggested that the amylase release was physiological. Microfilm $2.75; Xerox $4.80. 91 pages.

POLITICAL SCIENCE, GENERAL

CITY-COUNTY CONSOLIDATION ATTEMPTS IN NASHVILLE AND KNOXVILLE, TENNESSEE.

(Order No. 61-3517)

David Harold Grubbs, Ph.D.
University of Pennsylvania, 1961

Supervisor: Jewell Cass Phillips

Tennessee's four metropolitan centers--Memphis, Nashville, Chattanooga, and Knoxville are experiencing many of the same problems found in metropolitan areas generally. The purpose of this study is to examine the governmental problems within Tennessee metropolitan areas and in particular to analyze recent major attempts by two of the areas--Nashville and Knoxville--to solve many of these problems through city-county consolidation.

As an introduction to the principal part of the study, characteristics of the Tennessee metropolitan areas are described, with particular attention to population data; governmental problems within the areas are studied; major alternative proposals for metropolitan reorganization are reviewed; and the experience Tennessee metropolises have undergone in attempting to alleviate problems is considered.

In analyzing the attempts at city-county consolidation, the constitutional and statutory development of consolidation authorization is examined and the existing governmental arrangements in the Nashville and Knoxville areas are reviewed and compared with the changes proposed in the consolidation charters. Also, the political background of the reorganization attempts is examined.

Pro-charter and anti-charter forces in Nashville and Knoxville received special attention in terms of their composition, campaign techniques and their strengths and weaknesses.

Referenda results are analyzed with particular attention being given to the influence of economic status, race, party affiliation, and residence location on voting behavior.

Conclusions are drawn on two main points: (1) reasons for proposed charter failures and (2) feasible alternatives to city-county consolidation as a metropolitan government device.

Principal findings resulting from the study are:

1. Tennessee metropolitan areas will contain a majority of the state's population within the next two decades.

2. A wide variety of methods and devices are currently being utilized in the metropolitan areas to solve intergovernmental problems but annexation of territory by unilateral city council action appears to be the most feasible and effective method employed.

3. In the reorganization attempt in Nashville:

   A. The community power structure supported city-county consolidation.

   B. The major political leaders strongly advocated the plan as did the two traditionally rival daily papers.

   C. Opposition forces were virtually invisible until the last two weeks of the campaign at which time they undertook a blitz type campaign.

   D. Nashville Negroes tended to oppose consolidation largely through fear of political power loss through an expanded governmental unit.

   E. A direct relationship between economic status and pro-charter strength obtained as it did in Knoxville.

   F. Pro-charter strength declined as distance of residence from Nashville increased.

   G. Three of four satellite cities voted heavily in favor of consolidation.

4. In the reorganization attempt in Knoxville:

   A. Political leaders did not support reorganization but on the other hand strongly opposed it.

   B. Some businessmen, some civic and professional groups, and academicians supported the plan.

   C. Opposition forces were vigorous and well organized and led by major county officeholders and party leaders.

   D. No racial issue was raised in the campaign.

   E. The same relationship between economic status as found in Nashville held true in Knoxville. The same held true in regard to residence location and its relationship to charter support.

5. It is concluded that less drastic methods than city-county consolidation will continue to be used in the future with particular reliance on annexation being indicated.

Microfilm $5.30; Xerox $18.70. 413 pages.

MIKHAIL VASIL'EVICH FRUNZE AND THE UNIFIED MILITARY DOCTRINE

(Order No. 61-3437)

Walter Darnell Jacobs, Ph.D.
Columbia University, 1961

When M. V. Frunze died in 1925, a short and mercurial military and political career came to an end. In his forty years, Frunze was a political agitator, a political exile, a Red Army commander in the Russian Civil War, a member of the Central Committee of the Russian Communist Party and Minister for Military and Naval Affairs of the USSR.

In the Soviet Union today, Frunze ranks with the highest

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

figures in military and political history. He is honored for his party work, for his Civil War campaigns and for his work in military theory. In the West, however, his work in military theory is largely neglected.

The purpose of this study is to examine his writings on military theory and his military career and, on the basis of this examination, to provide the bases for an evaluation of his contributions to military science and affairs.

Frunze's military campaigns in the Civil War included command, in turn, of the Eastern Front, of the Turkestan Front, and of the Southern Front. On the Eastern Front, he contributed to the defeat of Kolchak by a series of battles culminating in the battle of Ufa. On the Turkestan Front, he directed the Red Army in campaigns against local anti-Bolshevik groups. On the Southern Front, he planned and executed the final defeat of Wrangel at Kakhovka and Perekop.

After the Civil War, Frunze devoted a major portion of his energies to the devising and developing of a theory of proletarian military science. He called his theory a "unified military doctrine" and claimed that the proletariat must have a military theory which reflected the distinguishing characteristics of the proletariat as a class--activity, the offensive, and maneuver.

The unified military doctrine was developed in a series of articles which Frunze published in military journals. The Frunze project came to the attention of the then Minister for Military Affairs, Lev Trotsky. Trotsky took sharp exception to the scheme and replied in articles also published in the military press.

The debate between Trotsky and Frunze on military doctrine was made part of the agenda of the Eleventh Congress of the Russian Communist Party. Trotsky and Frunze went to the fundamentals. Trotsky challenged Frunze on almost every element of his theory and Frunze provided answers which went beyond the limits of the discussions in the press which had preceeded the Congress.

Frunze also contributed ideas on the militia and the regular army, on the organization of the state in time of peace for the needs of war, on the rôle of technology in future war, on the method of training of troops and combat personnel, and on many other related military and political subjects. All these ideas are examined in light of their relation to Marxism-Leninism, in light of their relation to reality, and in light of their influence on subsequent Soviet military thinking and action.

The Soviet Union has no figure to rank with Frunze in military affairs. Frunze's right to that position is examined and discussed as the basic object of this study.

Microfilm $5.70; Xerox $20.05. 445 pages.

AN EXAMINATION OF SELECTED NON-GOVERNMENTAL ASSOCIATIONS WHICH ATTEMPT TO INFLUENCE THE FORMATION OF FEDERAL PUBLIC POLICY IN THE UNITED STATES

(Order No. 61-3716)

Robert William Kaufman, Ph.D.
The American University, 1961

The study was designed to describe and analyze the politics of issues as defined and contested by political interest groups in their attempts to influence public policy in the Congress of the United States. The investigation was directed to two closely interrelated areas: First, consideration was given to national organizations, their membership, and their legislative activities, and secondly, an examination was made of their legislative programs and the extent of legislative support given through coalitions of groups in areas of primary, as well as secondary interest. From the investigation, the study sought to test the thesis that a dual alignment of political interest groups exists, and that it is through the competition of these loosely allied groupings that major issues are raised for public discussion, political support is mobilized, and compromises resolving the issues are achieved.

In developing a broad sample of groups with legislative interests at the national level, the study selected 605 "national organizations" which participated in Congressional legislative activity during 1955. On the basis of information procured from the groups themselves or from secondary sources, the groups were arranged in a classification system developed to serve as a basis for the investigation.

The study was organized on the basis of selected public policy categories: First discussed were groups whose primary interest was non-commercial in nature, such as nationalists and internationalists, women's groups, veterans, government officials and professional organizations, conservation, and civil liberties. Another chapter considered groups with commercial interests, such as agriculture, cooperatives, electric power, housing and banking, foreign trade, and small business. The final substantive chapter discussed the "peak" groups of business and labor, along with certain research organizations and political action groups. A determination was made as to whether the groups participated on the "liberal" or on the "conservative" side of the policy area. Further, an examination of "primary interest coalitions" and "secondary interest coalitions" of groups permitted the classification of the national organizations into a dual alignment, one liberal, the other, conservative.

The study identified several types of organizations. Two types were found to have an individual base: the "mass membership" group and the leadership group, and three, a corporate base: those with business firms as members, such as the trade association, and two kinds of coalitions of national organizations cooperating either on the basis of a primary or a secondary interest. Foundations, research groups, and pamphleteers were classified as non-membership organizations. While primary interest coalitions were found to broaden the power behind the demand of a single minority interest, secondary interest coalitions and leadership groups appeared to perform a unifying and integrating function in the American system of group politics. The study discussed and classified 21 leadership groups, 25 primary interest coalitions, and 37 secondary interest coalitions.

The findings of the study supported the thesis that a dual alignment of groups exists, but, on the other hand, indicated that the power of each alignment as such was limited. Neither alignment had a "leader" in the strict sense of the term. While the peak groups played an influential role, theirs was chiefly a coordinating function which was operative only with the support and confidence of the other groups participating within the alignment. Further, since it was found that motivation was based on group

interest rather than on allegiance to an ideology, neither alignment could be considered definitive, and a condition of non-conflict with primary interest was prerequisite to participation. Microfilm $9.95; Xerox $35.45. 787 pages.

SOME PROBLEMS OF RUSSIAN CONSTITUTIONAL DOCTRINE OF THE "SIXTIES"

(Order No. 61-3733)

Eugene Pyziur, Ph.D.
University of Notre Dame, 1961

This disseration is a part of a study which deals with the rise of constitutionalism in Imperial Russia in the second half of the nineteenth century. With the ascent of Alexander I, political reforms became in fact unavoidable. They were made necessary by the gradual disintegration of Russia's political and administrative machine in the second half of the eighteenth century. As a retreat to the past governmental system became impossible, the curtailment of autocracy became the fundamental problem of Russian statehood of the nineteenth century. Logically the road ahead should have approached a representative system, as it had for Western Europe. A constitutional monarchy, accompanied by the pre-eminence of the class of gentry, seemed to be the first prospective step toward the transformation of Russia's political order. The political trend which advocated such a solution and endeavored to realize it became known under the name of Russian constitutionalism or liberalism.

The era of the "great Reforms," changing Russia profoundly, gave a push in this direction, and thus the so-called "sixties" of the past century engendered the constitutional and liberal strivings. But the precipitate development of the political process crippled the promising prospects of this movement. Yet in spite of all efforts at its suppression, constitutionalism never disappeared from the Russian political scene after its beginning in the sixties and with passing time it gained momentum although, due to the most unfavorable conditions, it remained until 1905 a "movement" rather than a coherent and modern political force, dispensing with party organizations and machines.

The summation of the theoretical problems connected with the introduction and realization of the representative system in Russia comprises the content of the Russian constitutional doctrine, the main topic of my dissertation. However, its exposition is preceded by a rather elaborate presentation of a series of problems, which lead to the proper understanding of constitutional doctrine, and which often demanded re-examination from a different point of view than that previously held. To the latter task are devoted Chapter I and II. The first depicts the ideological, institutional, political and social nature of Russian autocracy. The second advances a re-examination of the Russian ideological heritage of the nineteenth century from the point of view of its attitude toward political form and constitutionalism. Two other chapters deal with the outstanding advocates of representative system for Russia: Prince Peter V. Dolgorukov and Boris N. Chicherin. Their political doctrines and the program of constitutional monarchy for Russia are discussed and evaluated.

Microfilm $4.50; Xerox $16.00. 352 pages.

ERDEMLI: A CASE STUDY IN THE POLITICAL INTEGRATION OF THE TURKISH VILLAGER.

(Order No. 61-3472)

Joseph Simon Szyliowicz, Ph.D.
Columbia University, 1961

In 1941 a tourist travelling along the narrow winding road between Mersin and Silifke in southern Turkey would have been impressed with the number of sheep, goats and camels. There were few permanent buildings, everywhere men were erecting tents or tending their flocks. Women dressed in colorful home made costumes were carrying water, weaving, and performing their household chores. All this activity pointed to the existence of a typical semi-nomadic community which enjoyed few contacts with the outside world and whose inhabitants assumed that all strangers were tax collectors or conscription officers.

If the same tourist had returned in 1957, he would have been astonished at the dramatic changes. Stone houses were prevalent, as well as a hotel, two gas stations and many stores. Vegetable plots had replaced the uncultivated land upon which livestock used to graze. The villagers had become prosperous truck farmers, integrated into the national economy. Busses ran frequently and as a result of new contacts, the walls of self sufficiency and complacency were being broken down and new wants and desires aroused.

In the centre of the town was the government building. A kaymakam (district governor) was in charge of the new district which had been created with Erdemli as the center. This new status meant that the community's further growth was ensured. Dealings with the government no longer entailed long, expensive journeys. Further, a corps of experts was available to the inhabitants. But it also meant that the former carefree life was ended, the villagers were now cogs in the central government machinery.

Erdemli also became a municipality, electing its own mayor. The line of demarcation between the mayor and the administrator was legally defined, but in matters of detail was blurred. Herein lay the dynamics of local politics, for with the coming of free elections, a new power structure was created which rivalled the official machinery, sometimes conflicting with it.

The political considerations were new and they resulted from the transformation of Turkey's government into a multiparty regime. A landmark in the country's history was the election in 1950 when the Republican Party (CHP), which had been in power since the founding of the Republic, was defeated. The peasantry played a decisive role in the Democratic Party's (DP) victory and in its further success in 1954 and 1957.

This study attempts to analyze the bases of rural political behavior. A time sequency study was undertaken in one community to determine the extent to which local politics were influenced by social and economic factors as well as by traditional beliefs. The study is therefore divided into two parts. The first depicts the community's social and political structure in 1941 when the process of integration had barely begun. The Ataturk reforms are examined and their impact upon the community evaluated. The second deals with the situation in 1957. The economic and social environment is depicted in its political aspects and the political dynamics and formal institutions examined in detail.

It was found that despite the political and economic integration of the community into the national life, despite the exposure of the inhabitants to new ideas through travel and the communications media, many traditional beliefs and customs existed. The inhabitants' outlook and actions have remained based largely on traditional ideas and concepts. The political dynamics of village society are still largely a reflection of the past, and political decisions are greatly influenced by the cultural heritage.

Microfilm $4.55; Xerox $16.00. 353 pages.

THE POLITICAL IDEAS OF NICHOLAS OF CUSA WITH SPECIAL REFERENCE TO HIS DE CONCORDANTIA CATHOLICA

(Order No. 61-3475)

Morimichi Watanabe, Ph.D.
Columbia University, 1961

Nicholas of Cusa is one of the most interesting figures of the fifteenth century. Born at Kues in Germany in 1401, this son of a boatman took his doctorate in canon law at the University of Padua, won fame at the Council of Basel, and became Papal Legate in Germany, Cardinal of the Catholic Church, and finally Bishop of Brixen. Not only was he a prominent churchman, canon lawyer, philosopher, and humanist, but also he had a keen interest in science and Mohammedanism.

His fame as a political thinker has been mainly based on his De concordantia catholica which he presented to the Council of Basel in 1433. Of his political ideas, his doctrine of consent and his concept of unity have been discussed most often. Because of the important role the doctrine of consent played in the sixteenth, seventeenth, and eighteenth centuries, Nicholas's idea of consent has drawn much attention. But it is perhaps safe to say that the meaning of his idea of consent, which is solidly based on the medieval tradition, has often been misconstrued. The significance of his idea of unity and harmony, on the other hand, has not received enough attention.

The De concordantia catholica has been characterized as the best exposition of conciliar doctrines. To understand the political ideas of Nicholas of Cusa expressed in this book, we must analyze them in the light of the canonistic, publicistic, and theological writings which were available to the Conciliarists, including Nicholas of Cusa, and of the tragic events which led to the Great Schism, the Council of Constance, and later the Council of Basel. Like the other Conciliarists, Nicholas was from the beginning concerned about the unity of the Church. Favorably impressed by the success of the Council of Constance and by the initial proceedings of the Council of Basel, he advocated the doctrine of conciliar supremacy over the Pope. While upholding this conciliar viewpoint, however, Nicholas never failed to emphasize the importance of a respect for the See of Rome, which was in his view instituted to preserve the unity of the Church. In his treatment of the problem of the relationship between Church and State, Nicholas advocated the independence of the Empire from any papal interference and rejected the extreme pro-papal interpretation of the theories of the Donation of Constantine and of the translatio imperii. The conception of parallelism between Church and State, however, was in the final analysis subordinated to a unitary conception of a Christian society. It was the harmony and unity based on the mutual cooperation of the two powers that Nicholas emphasized in the De concordantia catholica.

When the Council of Basel became a center of conflict and dispute instead of harmony and unity, Nicholas understandably abandoned the conciliarist party and joined the supporters of the Papacy, which appeared to him a more effective institution to preserve unity and peace in the Church. Especially after his trip to Constantinople in 1437, his ideas underwent gradual change until with the aid of new philosophic concepts he could formulate his doctrine of papal monarchism. His theory of conciliar supremacy was pushed into the background and almost no discussion of representation appeared in his later writings. Yet Nicholas never became a papalist in the customary sense of the word.

The De concordantia catholica, described by John N. Figgis as a "magnificient expression of the ideal of a Christendom ruled by the principle of harmony, rather than that of uniformity," was perhaps the last book which expounded the medieval conception of the Respublica Christiana on a grand scale. Microfilm $4.95; Xerox $17.55. 387 pages.

POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

ORIGINS OF THE SOVIET CAMPAIGN FOR DISARMAMENT: THE SOVIET POSITION ON PEACE, SECURITY, AND REVOLUTION AT THE GENOA, MOSCOW, AND LAUSANNE CONFERENCES, 1922-1923.

(Order No. 61-3871)

Walter Carl Clemens, Jr., Ph.D.
Columbia University, 1961

The object of this essay is to examine the origins of the Soviet campaign for disarmament, to consider the nature of this campaign and the forces which molded it.

The starting point of the inquiry is the apparent transformation of the Bolshevik attitude toward disarmament which took place in 1921. Prior to that time, the Russian Communists had condemned all hopes for international disarmament as "pacifist" illusions, incapable of fulfillment within the framework of capitalist society. The sole way to obtain lasting peace, they argued, was to arm the proletariat and overthrow the bourgeoisie. Yet in mid-1921, when protesting Russia's exclusion from the Washington Conference, the Soviet Government stated that it could "only give a warm welcome to disarmament of any kind." Throughout the following year (and at frequent intervals thereafter) Soviet diplomats carried on a vigorous campaign for disarmament at international conferences. Communist spokesmen, however, continued to question profoundly the possibility of meaningful disarmament agreements under capitalism.

Ultimate Communist objectives had not changed. What then brought about the modification of Soviet tactics regarding the question of disarmament? A concatenation of

ideological and material factors emerging at the end of the years of "War Communism" seems to have been responsible. The Soviet state was weak--politically, economically, militarily. Neither the Bolshevik regime nor its enemies abroad were in a position to renew hostilities against each other in the foreseeable future. The prospect of an imminent revolution in Europe had disappeared. The Soviet leadership resolved, therefore, to protract and exploit the "breathing space" between wars by building up what it regarded as the real sinews of power--the economic potential, technological prowess, the morale and discipline of the nation--while working to undermine the cohesiveness of its foes and to cultivate the soil for revolution abroad.

These goals made it imperative--within the limits of state security--to reduce the human and material resources engaged in nonproductive military activities and to re-allocate them along the economic front. The Soviet regular army was reduced in spurts from almost 5,000,000 men in 1921 to less than 600,000 men in 1923. These reductions were paralleled by the introduction of universal military training, the establishment of a territorial militia which came to outnumber the regular army, and qualitative improvement of the regular units and their equipment. Soviet spokesmen used the reduction of the regular army as a basis to "demonstrate" the peace-loving character of Soviet foreign policy and to call upon other states to follow the Soviet example and disarm.

It is questionable not only whether the Kremlin expected its disarmament proposals to be adopted by the capitalist states, but even whether it desired their acceptance. The tone and content of the proposals were almost certain to make them obnoxious to other governments. The immediate interests of Soviet security would be served if other states disarmed to the extent already contemplated by the Bolshevik regime for its own forces. But it is implicit in Communist doctrine that the long-term goal of world revolution (and the absolute peace it was expected to bring) might be impeded if disarmament proved to be possible without overthrowing capitalism. Every peace program, Lenin had taught, was a deception unless it demonstrated to the masses the need for revolution. And Soviet adoption in 1922 of "liberal pacifist" slogans such as disarmament, Communist leaders affirmed, was designed to divide the bourgeois camp and to "dispel pacifist illusions."

The question of what consequences would follow capitalist acceptance of the Soviet disarmament program was made rather academic by the Bolshevik disbelief in the possibility of voluntary capitalist disarmament. The Kremlin seems to have assumed that its gains would be greater, whether or not its proposals were adopted, than if it made no proposals. It had much to gain and little to lose from its disarmament campaign.

Had the Soviet regime been stronger, of course, it might well have chosen other tactics to further its objectives. Microfilm $4.55; Xerox $16.00. 354 pages.

AMERICAN INFLUENCE ON THE EVOLUTION OF CONSTITUTIONAL GOVERNMENT IN THAILAND

(Order No. 61-3709)

Frank Clayton Darling, Ph.D.
The American University, 1961

The purpose of this study is to examine and assess the ideological and political influence of the United States on the evolution of constitutional government in Thailand (Siam) since Americans first had contact in the country early in the nineteenth century, with special reference to the period since 1932.

The methods used in this study have been the following: 1) extensive study of available official documents published by the governments of both countries; 2) extensive study of appropriate published and unpublished works in this field in the English and Thai languages; 3) personal interviews with American and Thai officials who have participated in the relations between the two governments; 4) personal observations made by the author while studying and teaching in Thailand from 1953 to 1956.

American influence in Thailand began when American trading vessels stopped at Bangkok early in the nineteenth century. Shortly thereafter American Protestant missionaries brought modern medicine, education, and technological innovations. In 1833 the first American diplomatic mission to the Far East negotiated a commercial treaty with Siam. Early in the twentieth century King Chulalongkorn employed an American adviser to assist Siam in its attempt to abolish the restrictions of extraterritoriality.

For almost a century the influence of Americans in Siam did much to impart some understanding of equality, freedom, progress, humanitarianism, and respect for law to government officials and a slowly-emerging middle class. The impact of these political and social values caused the absolute monarchy to become more benevolent and the administrative structure of the government was altered to cope with a modern technological age. The spread of Western ideas also had an increasing effect on the new Thai middle class, which eventually overthrew the absolute monarchy and established a constitutional regime.

American influence did not play a significant role on the Thai political system until World War II when cooperation with the Free Thai movement caused the United States to assist the rise of the liberals and the removal of the military regime. The United States gave considerable material and moral support to the liberal government in the early post-war era which made the first real attempt to establish some form of democratic and constitutional government.

The overthrow of the unstable liberal government by the Thai military leaders in November 1947 coincided with the attempt of the United States to deter Communist aggression in Southeast Asia by developing closer relations with stable and conservative governments in the area. The United States accordingly provided the new military regime in Thailand with large-scale military and economic aid regardless of its internal policies or methods of achieving power.

The Korean War and the Indochina conflict caused the United States to increase its military and economic aid to Thailand and to keep the Thai government closely aligned with American foreign policy objectives in the area.

The provision of arms to the authoritarian military regime enabled it to remove all internal opposition to its rule, and since 1952 the struggle for power within the military regime itself has eventually concentrated absolute power in the hands of one military dictator.

American influence in Thailand prior to 1948 has consequently done much to promote the psychological and material conditions which made an attempt to establish a constitutional political system possible. During this time some progress was made in acquainting more people with Western political values and institutions, although the traditions of many centuries caused the attempt at constitutional government to fail.

After 1948 the influence of the United States in developing Thailand as an anti-Communist ally in Southeast Asia has enabled the military regimes to eliminate the modest progress made toward constitutional government, and the Thai political system has returned to a modern version of absolute rule.

Microfilm $5.60; Xerox $19.80. 440 pages.

THE OUT-OF-COUNTRY EXPERIENCE OF COSTA RICANS SPONSORED BY THE UNITED STATES TECHNICAL COOPERATION AGENCIES, 1952-1956: A STUDY OF TECHNICAL COOPERATION TRAINING.

(Order No. 61-3712)

Katherine Hunter Hoben, Ph.D.
The American University, 1961

Statement of the Problem

Training has been officially sponsored by the United States government technical assistance agencies since the inception of the foreign aid program in 1950. It is an important aspect of foreign aid, since through training the competence of an increasing number of persons, from the leader down to the semiskilled worker, in various fields of activity, is augmented. This promotes economic development through the efforts of the underprivileged countries themselves and permits an orderly discontinuing of United States aid and the services of U. S. technicians.

It is fundamental, however, that the training of such a program be directed toward the needs of the underdeveloped country and the capacities of the individual sent for training. Subsequently the training must be applied as fully and as effectively as possible.

Technical cooperation has been given to Costa Ricans from the beginning of the aid program in all fields in which assistance was offered. Since little data are available on such training prior to 1952, the out-of-country training of Costa Ricans between 1952 and 1956 was selected as the scope of the study.

Procedure

From late 1952 through 1959 the author was resident in Costa Rica, where her husband was attached to the United States Operations Mission.

Data for the study were gathered from the records of the United States Operations Mission to Costa Rica and by interviews with all but about one percent of the Costa Ricans who went abroad for training during the period studied (roughly 200 cases). A general study was made of problems of economic development and cross-cultural education. Policies and procedures of the sponsoring agency in administering and programming training were examined. Information about each trainee was collected according to a schedule which included data on the characteristics of the trainee, description of the training received, reaction of the trainee to his training, and type of utilization of training.

Results

It was found that the training experience of the Costa Ricans was greatly affected by policies (or lack of them) and procedures at the Washington level. This was true of training administration, programming, orientation and (to some degree) follow-up. The out-of-country experience of the Costa Ricans on the whole was satisfactory, though there were complaints regarding the kinds of programs arranged and some aspects of administration.

The training planned by the United States Operations Mission to Costa Rica fitted well the total country technical assistance program, although the backstopping agencies in Washington and Puerto Rico were not always able to provide the kind of training the Mission and trainee thought most effective.

The caliber of the Costa Rican trainee is high. He is receptive of the training given, is friendly to the United States, and wishes to make a contribution, through increased competence, to the progress of his own country. The majority of the Costa Ricans trained up to 1956 came from the middle group in the hierarchy of government positions. The record of training utilization is high. The problems and the exceptions indicate basic weaknesses which should be studied and corrected.

Conclusions

Training, as seen in the experience of the Costa Ricans, is a large and important component of foreign technical aid and should be continued and augmented. It could be greatly improved by dedicating more money and thought to it especially at the Washington level, thus ensuring better and more job-related training. An effort should be made to define and elucidate the contribution of training to technical cooperation and the influence of cross-cultural education, and to discover and apply methods of more exact programming and guarantees for effective training utilization. Microfilm $5.25; Xerox $18.45. 410 pages.

THE UNITED NATIONS EMERGENCY FORCE

(Order No. 61-3903)

Gabriella Edith Rosner, Ph.D.
Columbia University, 1961

The United Nations Emergency Force was hastily created at special sessions of the General Assembly on November 5 and 7, 1956 in direct response to the severe

political crisis in the Middle East and the military invasion of Egypt by Israel, France and the United Kingdom. Designed as a temporary police force operating with the consent of Egypt and the cooperation of contributory states, UNEF was primarily assigned the task of supervising withdrawal of non-Egyptian troops from Egyptian territory and securing compliance with United Nations resolutions. In more than four years of service, however, the Force has not only been concerned with a great number of far-reaching duties and responsibilities, but has also been recognized as an important contribution to international organization's techniques of peacemaking.

UNEF, indeed, although a para-military experiment with limited functions and aims, represents the prototype of a small police unit which the international community might well find useful to utilize at other times of crisis. It was the success of the Emergency Force which encouraged the establishment, on July 14, 1960, of the United Nations Force for the Congo. The Congo operation leans heavily upon UNEF's experience, and future military operations of a similar kind will certainly draw lessons from it as well.

A comprehensive analysis of the United Nations Emergency Force --- the plans and efforts in the past to constitute an international military force, the circumstances leading to UNEF's creation, the functions and powers conferred on the Force, and the composition, organization and control of it --- is made in this case study. Many of the problems consequent to the establishment of UNEF, as well as a number of the controversies engendered regarding its utilization, constitute an important part of the analysis. UNEF's legal basis, its legal status and financial situation are examined, both because these matters are of some importance so far as the Emergency Force is concerned, but more importantly, because of their bearing on the possibilities of establishing other international military operations, or a permanent United Nations force in the future. It is thus not only for the result achieved but for the hopes aroused that a thorough study of UNEF warrants consideration.

The results achieved are notable. Fighting in Egypt was quickly checked, widespread hostilities were contained, cold war antagonisms were not allowed to enter upon the scene of strife. Immediate danger of war was averted and the invasion retained its character of an incursion --- a "Sinai campaign." Although Soviet and American pressure no doubt exercised considerable influence upon Britain, France and Israel to cease fire and to withdraw, the genesis of an impartial police force, designed for the purpose of supervision, control, and representation, was also of cardinal importance. UNEF represented a "face-saving" mechanism for all the nations concerned; it established United Nations presence in zones of special sensitivity in the Middle East; it undertook grave tasks at times of keenest tension. The rift between the Allies in the autumn of 1956 was undeniably great; with the aid of UNEF as an instrument of peaceful settlement, it did not become a gulf of unbridgeable proportions.

Since 1957, a heartening quiet prevails on the Israel-Egypt border and patrol by UNEF soldiers of the Egyptian side of the armistice demarcation line continues effectively. At the mouth of the Gulf of Aqaba, a UNEF unit oversees peaceful conditions in the area of the Straits. Indeed it is UNEF's presence, indicating active United Nations interest, which seems to have had a distinct bearing on relief of tension between Egypt and Israel.

The establishment of UNEF, then, was a distinct triumph for international organization. For the first time in history, a truly effective international police force came to function in the service of peaceful settlement of a dangerous dispute. With it, the United Nations made available, in Lester Pearson's words, "an intermediate technique between merely passing resolutions and actually fighting."

Microfilm $4.40; Xerox $15.55. 341 pages.

POLITICAL SCIENCE, PUBLIC ADMINISTRATION

PERFORMANCE BUDGETING AND ACCOUNTING POLICY IN THE DEPARTMENT OF THE ARMY

(Order No. 61-3718)

Ezra Lander, Ph.D.
The American University, 1961

This study describes the actions taken by the Department of the Army through 1960 to implement the performance budget and related financial management improvements in accordance with the National Security Act Amendments of 1949 and other statutory and administrative requirements. A critical review is made of the degree to which these actions have contributed to increased efficiency and economy, as well as of the need for additional improvements.

Supporting problems covered are:

1. Development of the Army performance budget structure.
2. Relationship between the Army funding system and the performance budget.
3. Growth of working capital funds and their relation to performance budgeting.
4. Contribution of integrated accounting to performance budgeting.
5. Impact of obligation, disbursement, cost, and accrued expenditure bases of budgeting.

The Army performance budget structure represents an improvement over the structure it superseded. It is more useful for executive and legislative review, as well as for budget execution and control. Nevertheless, a true program or performance budget has not yet been fully attained. The present appropriation structure by itself is inadequate from a planning, program review, and decision-making viewpoint. On the other hand, it offers advantages from the viewpoint of Congressional control and budget execution. Specific recommendations are included in Chapter II for improving the Army performance budget structure.

Progress has been made in improving the Army funding system, but there is still room for improvement. From a multitude of detailed funding limitations from many sources, the Army has moved steadily toward broad level funding from a single source. Additional funding improvements are recommended in Chapter III in the areas of timeliness

of funding, consumer funding, broad level funding, and single-source funding.

Working capital funds have proved their value under specific circumstances. They provide significant advantages over the former system of control by a multitude of individual allotments and ownership accounts. Some of the official objectives of working capital funds are met in whole or in substantial part, others may be accomplished equally well under appropriation financing, whereas others are not accomplished at all. Alternative methods of financing, such as the Ordnance Stock and Shop Expense accounts, automatic availability of reimbursements, advance apportionment, and management funds, offer advantages under certain circumstances. Specific recommendations are included in Chapter IV for improving the operation and usefulness of working capital funds.

Significant accounting changes have been made by the Army in recent years. It has established an integrated accounting system on an accrual basis for working capital funds and the Operation and Maintenance appropriation. It has also established monetary property accounting for all appropriations. Nevertheless, considerable work must be done merely to complete what has been started and to refine and improve accounting systems already installed. Specific recommendations are included in Chapter V for improving the over-all accrual accounting system including cash, fiscal, cost, financial property, and revenue accounting.

The basis of budgeting has been extended by the Army from traditional obligational budgeting to cover disbursement, cost, and accrued expenditure budgeting in specific areas. Chapter VI describes the various bases of budgeting and their interrelationships. It also presents a statistical analysis by appropriation, and devotes particular attention to disbursement and procurement budgeting. Specific recommendations are included in Chapter VI for improving obligation, disbursement, cost, and accrued expenditure budgeting.

Aggressive action is required not merely to install needed financial management system improvements, but even more important to make maximum utilization of them once they are installed. Improved performance budgeting and accounting can make significant contributions to decision-making and management in the Army.

Microfilm $5.85; Xerox $20.75. 457 pages.

PERSONNEL MANAGEMENT IN THE UNITED NATIONS SECRETARIAT

(Order No. Mic 61-2773)

Ali Abdel Aleem Mahgoub, Ph.D.
University of Michigan, 1961

The problems of personnel management in the United Nations Secretariat arise from such basic difficulties as multiple languages, reconciliation of national differences in administrative philosophy, a world-wide recruiting ground, conditions of service that necessitates the expatriation of the staff members and their families, and the relationship of the staff members with the United States as the host country.

Many of the perplexities center around attempts to recruit, test, investigate, and select candidates on some objective and accurate basis, in the face of such handicaps as national quotas for the international staff, vast differences in educational systems, uneven distribution of qualifications, and the relatively limited opportunity for careers. In addition is the special consideration of assuring the employment of a staff that will be supremely devoted to the purposes of the United Nations above all other loyalties.

The purpose of this study is to discuss these problems, emphasizing the unique characteristics of the operation of an international organization such as the United Nations Secretariat. The data collected were from three main sources: references, published and unpublished documents, and other material dealing with the subject; interviews with staff members in the Secretariat and with members of delegations; and personal observations.

The study deals generally with the following topics: the general nature and functions of the U. N. Secretariat; the organization and functions of the Office of Personnel; the basic characteristics of the personnel system in the Secretariat; recruitment and appointment of employees; the position classification and pay plan; promotion, transfer, periodic reports and training; conditions of service and staff welfare; separation from the service; employee conduct; employee privileges and immunities; and staff problems.

Several general conclusions are reached in the study.

1. The United Nations Secretariat has certain problems that are common to all administrative organizations, and others that are peculiar to itself or that have special aspects which are distinct from those encountered by national civil services.

2. There are two criteria for the recruitment and selection of the Secretariat staff: personal qualifications and geographic distribution. The two must be combined in such a way as to secure the success of the whole organization.

3. Conditions of service in the Secretariat are satisfactory in general. However, the familiar problems of recruitment, selection, classification, salaries, allowances, promotions, leaves, tenure, pensions, and staff activities take on special complexities in an international Secretariat.

4. The personnel system in the U. N. Secretariat has been influenced by both American and continental European systems. The personnel program in the Secretariat, however, should not be borrowed from other personnel systems, but should rather evolve naturally as a result of its own special needs and purposes.

5. There are individuals on the staff whose jobs are not of a caliber befitting their ability and experience. On the other hand, there are people in positions for which they are not well qualified. The reasons for this are fourfold: the relative newness of the U. N. Secretariat, the precedent of over-grading inherited from the early classification system, the need to draw personnel from various geographic areas which reduces the weight given to other qualifications, and finally, political pressure which tends to push the grading upward.

6. One of the most remarkable accomplishments of the Secretariat is the success with which several thousand employees from over seventy countries have been molded into an effective working staff. The experience has proved that an international civil service is possible and that it not only can function, but it can compete with the most

successful national administrations in efficiency and competence.

7. In general, the competence and integrity of the staff members of the Secretariat are of the highest caliber. A great majority of them are able persons who display a deep devotion to the principles of the Organization and seek to pattern their conduct on the highest ideals of an international civil service.

Microfilm $5.50; Xerox $19.35. 429 pages.

INTERGOVERNMENTAL FISCAL RELATIONS IN PUBLIC EDUCATION IN LOUISIANA, PRIOR TO 1959.

(Order No. 61-3786)

Harold Troxel Porter, Ph.D.
Tulane University, 1961

Chairman: Lawrence Vaughan Howard

The purpose of this study is to describe the legal and administrative provisions which governed federal, state and local governments and their agencies in raising and spending money for the public school system in Louisiana prior to 1959. The study thus encompasses the fiscal functions of school boards and parish civil agencies, the state and its agencies, and the federal government and describes the relationships which existed among them.

Public education in Louisiana is organized primarily on the parish-unit basis, with sixty-four parish and three city school systems. Financial responsibilities at the local level are concentrated very largely in the hands of the elected local school board, although property assessments are made by the elected parish assessor and property taxes are collected by the elected parish sheriff. The school board has the authority (1) to levy the five-mill constitutional tax, (2) to call elections to ratify special taxes for construction and operation up to five mills and additional support up to seven mills, (3) to call elections to approve bond issues, and (4) to adopt a budget of expenditures. Special elections to impose taxes or issue bonds may be held on a parish-wide or a special district basis and must carry by a majority of those voting both in number and in amount of assessments voted.

The major development in recent years has been the great growth of state grants-in-aid to local school boards, so that state support now amounts to about eighty per cent of local school expenditures. The grants-in-aid are financed largely by dedicated taxes, chiefly those on the extraction of natural resources, and are administered by the State Board of Education and the State Superintendent of Education. The methods of distribution include (1) allocations made on the basis of the number of educables, (2) a complex equalization formula, and (3) aid for special educational programs. In addition, the state makes direct expenditures for trade and vocational schools, retirement systems, textbooks, and vocational rehabilitation.

Administrative fiscal controls over local school boards are exercised by a number of state agencies. Special local elections to impose taxes or issue bonds must be approved by the State Bond and Tax Board. Local school budgets must be approved by the State Budget Committee. Records of financial operations must be kept and reports made in accordance with standards established by the State Board of Education. Annual audits are made by the State Supervisor of Public Funds.

Federal aid to education is restricted to the donation of sixteenth section lands, matching funds for vocational education, vocational rehabilitation, school lunch and school milk programs, and direct aid to federally affected areas. Federal funds are transmitted to and administered by the State Board of Education.

Probably the most significant development from the standpoint of intergovernmental relationships is the fact that while the state has assumed greater responsibility for raising revenues since World War II and has established the machinery for greatly expanded administrative controls, the agencies of the state have not exercised those powers in a significantly restrictive manner. Also the relationships between agencies at the local level and between local school boards and the state are made much simpler because of the small number of local school systems. Microfilm $2.75; Xerox $9.25. 204 pages.

RELATION OF EXECUTIVE LEADERSHIP TO THE FACTOR OF EXTERNAL AUTHORITY: A STUDY OF BOARD-EXECUTIVE RELATIONSHIPS IN FIVE FAMILY AGENCIES.

(Order No. Mic 61-2014)

David E. Tanenbaum, D.S.W.
University of Pennsylvania, 1959

Supervisor: William D. Turner

The writer's experience and the literature of social work and related literature suggested the need for a more insightful understanding of leadership and authority factors that conduce toward an integration of board-executive activities for the achievement of an effective agency service. The problem selected for study was to determine if any relationship exists between an administrative board's authority to which the executive is exposed and the leadership which he expresses, and, if so, to identify elements of this relationship so that propositions could be drawn from them.

The basic assumption that the board and the executive influence each other within relationships accounted for the following primary hypotheses: (1) The board's or executive's use of personal power, in contrast to authoritative power limited by the agency's function and the respective functions of board and executive, has a sundering influence on their relationship. (2) Executive leadership predicates both the board's and the executive's mutual acceptance of their authorities. (3) Executive leadership is expressed essentially by the skill with which the executive carries, within a process, his functional roles of integrating and coordinating agency parts. (4) Board members will be more likely to sustain the executive's leadership when they experience his helping them to carry responsibly their own functions.

During the period March 22 to May 1, 1956, the writer conducted open-ended, prolonged interviews with five private family-agency executives whose competency as leaders had been established by various criteria. A prearranged

questionnaire was used as a guide for the wire-recorded interviews. The frequency with which salient items of content appeared in the answers of the respondents was observed by the writer. Fifty-nine propositions, confirming the hypotheses, were derived from those items of content which three or more of the respondents agreed helped them contribute leadership to their boards.

The major findings in the study indicated that differences in the executive's response to external authority may be ascribed, in part, to the nature of his pattern in dealing with authority; the intensiveness, or closeness, with which his relationship with a group, such as the board, is maintained; and the extensiveness, or continuity, in this relationship over a period of time. Also, the executive feels more identified with a group when his relationship with it is regulated by a functional authority that defines clearly both his and the group's responsibilities in regard to specific areas of purposeful activity; such authority enhances executive leadership and is valued as an indispensable element of structure within the board executive relationship.

The results of the study permit the following principal conclusions: The board influences positively the executive's leadership when it accepts its own authority as limited to particular roles in function; accepts the executive's function; accords him a prestige appropriate to his position; delegates authority to him which is commensurate with his professional responsibilities; and affords him both occasion and scope for self-expression. The negative influence of board authority upon the executive's leadership occurs when the board engages in the use of personal power in relationship with the executive; is unable or unwilling to assume the responsibility and authority that accompany its function; lacks clarity about the agency's purpose and function; and does not generally attribute significance to the differentiated functions of agency parts.

Microfilm $8.85; Xerox $31.50. 700 pages.

PSYCHOLOGY

PSYCHOLOGY, GENERAL

GRANDMOTHERS' ATTITUDES AND MOTHERS' CONCERNS

(Order No. 61-3870)

Alma Marian Halbert Bond, Ph.D.
Columbia University, 1961

This study investigated the relationship between mothers' concerns and certain attitudes toward child rearing expressed by the maternal grandmothers. It was based on the assumption that concerns are a manifestation of fear, and that fear is an aspect of the total-personality, which can be related to home background to the same degree as any other variable. Furthermore, it was postulated that attitudes of grandmothers regarded as detrimental to sound child rearing can curtail ego development in mothers, leaving them less able to cope with the numerous tasks of motherhood, and therefore more vulnerable to fear. Therefore, it was hypothesized that there is a positive relationship between the number of concerns expressed by mothers on a Maternal Concerns Questionnaire (MCQ), and the following clusters of attitudes expressed by grandmothers on a shortened version of Parental Attitude Research Instrument (PARI):

(1) The sum of attitudes which are regarded as detrimental to sound child rearing; (2) suppressive attitudes to children; (3) hostile rejection of homemaking; (4) the demand for striving in children; (5) overpossessiveness to children; and (6) the tendency to harsh punitive control of children.

The experiment was conducted with 53 pairs of mothers and maternal grandmothers of infants. The 78-item MCQ was based largely upon Blum's study of maternal concerns, while 15 scales were selected from PARI to assess grandmothers' attitudes. These scores were correlated with each other in order to test the hypotheses. Separate correlations were computed for upper and lower socioeconomic levels of the population.

Contrary to the hypotheses, the postulated relationships in the population as a whole generally were not confirmed. Results, however, tended to show a relationship between attitudes toward child rearing expressed by upper class grandmothers, and number of maternal concerns. In addition, a multiple correlation, in which all PARI factor scores obtained for the upper socioeconomic levels were related to mothers' concerns, yielded a coefficient of .836.

In addition to the investigation of the hypothesized relationships, there were other interesting findings.

1. Lower class grandmothers condone harsh punishment, and generally express attitudes regarded as detrimental to sound child rearing more than grandmothers in the upper classes.
2. There is a significant relationship between mothers' and grandmothers' attitudes toward child rearing, although mothers appear more "permissive" than grandmothers in every aspect measured.
3. The greater the difference in attitudes between upper level mothers and grandmothers, the greater the number of mothers' concerns, but mothers' expressed attitudes toward child rearing bear no relationship to the number of their own concerns.
4. There is a negative relationship between upper level grandmothers' education and maternal concerns, while no such relationship is evident between maternal education and concerns.

The discrepancy between the classes was interpreted largely in terms of the instruments used to measure the dynamics. Findings concerning class and generation differences are in accordance with the findings of earlier studies. Microfilm $2.75; Xerox $5.00. 96 pages.

THE RELATION OF CONTROLLING AND HOSTILE ATTITUDES OF MOTHERS TO CERTAIN PERSONALITY TRAITS IN CHILDREN

(Order No. 61-3707)

James Morrison Colwell, Ph.D.
The American University, 1961

Four relatively independent personality traits found in a population of "normal" children were defined by rating scales made up of statements descriptive of children who could be called 1) well-adjusted; 2) dependent-immature; 3) withdrawn; 4) acting-out aggressive. Scales were constructed of items which three clinical psychologists independently classified as belonging to the same category. Using these scales, all 200 5th and 6th grade pupils in the public school of a midwestern farming community were rated by two of their teachers. The mothers of the 89 children most typical of one of the four personality traits were interviewed and given the Parental Attitude Research Instrument (PARI).

After the 23 PARI scales were scored separately, beta-weighted composite Control and Hostility scores were obtained on the basis of a factor analysis by Schaefer of PARI multiparae data. Product moment correlations were computed between personality trait ratings of the 89 children and their mothers' scores on the individual PARI scales, plus their Control and Hostility scores. In addition, the 25 attitude scale scores of mothers of children extreme on each personality trait were compared by means of t-tests.

The results generally support a relationship between maternal control and child personality traits. Mothers' Control scores correlated significantly with the children's Well-Adjusted, Dependent-Immature, and Withdrawn scales, but not with Acting-Out Aggressive ratings. No correlation between maternal Hostility scores and children's traits was significant.

Negative correlations significant at the 5% level or better were obtained between children's Well-Adjusted ratings and 14 of the 23 PARI maternal attitude scales. Highest were correlations of -.501 with Inconsiderateness of the Husband, -.406 with Suppression of Sex, and -.404 with Suppression of Aggression. The Dependent-Immature and Withdrawn scales each correlated significantly and positively with six PARI scores, while Acting-Out Aggressive ratings were not correlated significantly with any part of the PARI.

Comparisons of the mothers of children most typical of each personality trait, by means of t-tests, suggest the following: 1) Mothers of the Well-Adjusted group exhibited less controlling attitudes than mothers of the other children; 2) mothers of the Dependent-Immature group favored close maternal control of the child but tended toward benevolent domination rather than harshness; 3) mothers of the Withdrawn group differed most radically in their attitudes from the other mothers, demanding strict obedience in many areas of the child's life; 4) mothers of the Acting-Out Aggressive children also favored considerable control over the child.

Although differences in hostile attitudes between groups of mothers were not found, the results suggested the possibility that rejection, as distinct from hostility, may characterize the mothers of the Withdrawn and Acting-Out Aggressive groups. Child IQ and socio-economic status were found to be highly related to ratings on the Well-Adjusted scale, but negatively related to maternal Control scores. Microfilm $2.75; Xerox $6.00. 124 pages.

MOTOR DEVELOPMENT AND SELF-CONCEPT AS CORRELATES OF READING ACHIEVEMENT

(Order No. 61-3596)

Lee Biggerstaff Copple, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Jum C. Nunnally

Reading retardates whose difficulty cannot be 'explained' in terms of frequently explored variables (sensory handicaps, emotional disturbances, etc.,) often appear in the clinic as physically underdeveloped or awkward. Furthermore, their histories indicate 'avoidance' of activities involving physical or athletic competition. This study examines the hypotheses that achievement of reading skills is a correlate of (rather than compensation for) (1) motor development and physical fitness; (2) recognized athletic ability; and (3) the individual's self-concept with reference to physical development and athletic skills.

Methodology. Subjects for the study were 102 white fifth grade boys from four public schools in Murfreesboro, Tennessee. The Lorge-Thorndike Non-verbal Intelligence Test, the Gates Reading Survey (Form 2), a sociometric measure of choice for hypothetical athletic teams (completed by peers and teachers), and an author-constructed self-concept scale (including athletic, social, and academic activity items based on Jersild's self-concept studies) were administered in classroom groups. Results of the Lorge-Thorndike Verbal Intelligence Test and the Stanford Achievement Tests were also available. Twelve motor development tasks, representing the five factors emerging from a factor analysis study by Pangle, were administered individually. These factors included speed and strength, body build and growth, hand-eye coordination, pulse rate function, and muscular power.

Results. Reliabilities for self-concept and peer ratings were high, suggesting the feasibility of these measures for this purpose. With effects of age, verbal and non-verbal intelligence, and general achievement partialed out by the square root method of factor analysis, "partial" correlations remaining did not support the principal hypotheses. (1) Only one of the motor achievement tasks (left hand grip) proved significantly correlated with reading achievement in the predicted direction. The remaining motor measures were about equally divided between correlations in the predicted and non-predicted directions, but the correlations were all small. (2) Partial correlations between reading achievement and peer and teacher ratings of athletic achievement were in the reverse of the predicted direction. (3) The partial correlation between reading achievement and the "athletic" self-concept was also in the non-predicted direction. Conclusions from the major hypotheses therefore suggest that the predicted correlative

model cannot be supported, and there is even some suggestion that compensation for low athletic/motor competency may be found through reading achievement.

Incidental findings of the study which are of some interest include the following: (1) The self-concept as measured by this study is a reasonably consistent variable, both with regard to internal reliability of its separate divisions (social, athletic, academic) and also across divisions, but the correlations are not sufficiently high to justify speaking of 'the' self-concept of an individual. (2) Significant correlations exist between the 'athletic' self-concept and the ratings of peers and teachers. (3) Verbal and non-verbal intelligence and general achievement account for so high a proportion of the variance in reading achievement in this group of subjects (in contrast to most such studies) that little variance remains to be explained by additional factors.

Conclusions. The principal conclusion which one can draw from this study is that it gives no substantial support to the hypotheses that motor achievement and self-concept contribute to the avoidance reaction which is observed in many reading retardates. Rather, it suggests that it would be profitable to study the means by which compensatory mechanisms play their part in reading achievement. Furthermore, it leaves unanswered, but still of very real practical importance, the question of which aspects of the below-average reader's life do provide him with the avoidance response which has been observed in many such persons. Microfilm $2.75; Xerox $3.00. 52 pages.

AN EMPIRICAL INVESTIGATION OF CERTAIN HYPOTHESES CONCERNING ERROR PERFORMANCE ON CANCELLATION-TYPE TASKS

(Order No. 61-3607)

Richard Popham Kern, Ph.D.
State University of Iowa, 1953

Chairman: Associate Professor H. P. Bechtoldt

The present study investigated: first, the stability of error performance over parallel forms of a cancellation-type task as a function of the frequency and type of instructions presented on intervening trials of a task relatively dissimilar in terms of content; and second, the stability of error performance over tasks dissimilar in terms of content, but which were relatively similar in terms of instructions and item format. This second procedure was carried out in the absence of differentially influencing instructions.

Two definitions of error performance were considered, the number wrong and the ratio of the number wrong to the total number of items attempted.

A total of 210 men and women undergraduate students enrolled in two elementary psychology courses at the State University of Iowa served as Ss. Thirty Ss were randomly assigned, before testing, to each of seven groups. Five of the seven groups received the following sequence of tasks: Highest Number, Form A; Unfurnished House; Design Copying task (four forms administered consecutively); Highest Number, Form B; and, a "speed" and "accuracy" preference questionnaire. The procedure differed for these five groups only in that either speed or accuracy instructions were administered on the design copying trials for either the last two trials (Groups S-2 and A-2), or for all four of the trials (Groups S-4 and A-4). A fifth group (C-4) received all four trials under instructions stressing both speed and accuracy.

Two other groups (PS-4 and PA-4) served as controls for practice effects on the parallel forms of the Highest Number task.

The Unfurnished House task and the two forms of the Highest Number task were administered only under instructions stressing both speed and accuracy.

Parallel analyses of the data were performed for the two scoring procedures. The techniques used were analysis of variance, t tests, and correlational analysis.

The discrepancies among the Highest Number prepost mean differences for the various groups were in the direction predicted in the event that the variables, type of instructions and frequency of instruction presentation, were important factors. However, the analysis of variance for the data failed to support the hypothesis that error performance was, to any important extent, a function of these two variables.

There was no evidence that practice effects exerted an appreciable influence on either type of scores for the final form of the Highest Number task.

The coefficient of stability and equivalence, obtained by computing the average correlation between the initial and final forms of the Highest Number task for the five groups which received both forms, was .55 for ratio scores, and .58 for wrong scores.

The average correlation obtained between error performance on the initial form of the Highest Number task and the Unfurnished House task was significantly different from zero only in the case of the number wrong scoring procedure ($\bar{r}$ = .20).

The average correlations obtained between the "speed" and "accuracy" questionnaire scores and error performance on the cancellation-type tasks were not significantly different from zero.

Analysis of the number of designs drawn on the trials under the various experimental instructions indicated that performance on this task was clearly a function of the type of instructions and the frequency of their presentation.

On the basis of the present evidence it is concluded that the major portion of error score variance on the Highest Number task can be attributed to temporary factors which vary over relatively short periods of time, and to the specific item content. As applied to the Highest Number task, the notion that error performance reflects significant sources of variance attributable to general work methods, response sets, etc., does not appear to be a useful one, at least in terms of predictive utility.

It was suggested that further investigation of error performance on the Unfurnished House task might be warranted in view of the extremely wide range of individual differences obtained on this task.

Microfilm $2.75; Xerox $5.80. 118 pages.

THE EFFECTS OF EXPERIMENTER ATTRACTIVENESS AND NEGATIVE REINFORCEMENT ON VERBAL CONDITIONING

(Order No. 61-3537)

Martin Marder, Ph.D.
University of Pennsylvania, 1961

Supervisor: Seymour Feshbach

This paper has attempted to examine verbal conditioning, in the case where reinforcements are negative, in terms of social influence processes. Two variables singled out for investigation were the attractiveness of E, who is the person seeking to influence S by administering negative reinforcements, and the intensity of the punishment. Attractiveness was experimentally manipulated by E's playing either a positive or negative role in relation to S. Two levels of negative reinforcement were employed by E. In the mild condition, this consisted of a negative statement by E, and in the severe condition, E administered painful electric shocks. Four groups of college females, 66 Ss in all, were randomly assigned to the four treatment combinations of high or low attraction for E and mild or severe negative reinforcements. In addition, there was a control group of 14 Ss who did not receive any reinforcements. The task consisted of pairing off any one of three personal pronouns with a verb. A different stimulus verb appeared on each trial, but the three pronoun alternatives were the same for each of the 140 trials. During the first twenty trials, designated by the term "operant level," no reinforcements were administered. On trials 21 to 80 (acquisition session), a continuous reinforcement schedule was operative, the reinforced response for each S being that one which she emitted most frequently during operant level. Following trial 80, E departed from the room, while S continued on her own for the remaining sixty trials (extinction session) as her responses were being tape-recorded.

On the basis of other studies in this and related areas, as well as a theoretical analysis in terms of social influence processes, the following hypotheses were offered: 1a) The group confronted with an unattractive E who administers mild, negative reinforcements (verbal negative group) displays less conditioning during the acquisition session than the group confronted with an attractive E who administers mild, negative reinforcements (verbal positive group). 1b) During the extinction session, the verbal negative group displays a response decline indicative of a delayed conditioning effect. 2a) Both severe negative reinforcement groups are significantly below the control and the verbal negative groups at the conclusion of acquisition. 2b) The group confronted with an unattractive E who administers severe, negative reinforcements (shock negative group) displays a response rise during the extinction session which places it above the group confronted with an attractive E who administers severe, negative reinforcements (shock positive group), i.e., the shock negative group displays more extinction.

The results were consistent with hypotheses 1a and 2a, but hypothesis 1b received very limited support. The verbal negative group displayed the predicted decline in the middle of the extinction session, but this was followed by a response rise. During the middle block of extinction trials, the verbal negative group was significantly below the control, but the intra-group difference between this block and the last block of acquisition only approached significance. Results for the shock groups during extinction were directly opposite to that predicted in hypothesis 2b. The shock positive group displayed almost total recovery and the shock negative group almost no recovery. To explain the behavior of the positive group, a dissociation of punishment from source concept was offered, while the negative group's behavior was explained on the basis of inhibition. The results for the verbal groups were seen as extending the findings of other studies to the negative reinforcement or punishment situation.

Microfilm $2.75; Xerox $3.80. 68 pages.

COMPETENCE AND STRESS: AN ANALYSIS OF INDIVIDUAL DIFFERENCES IN TEST PERFORMANCE.

(Order No. 61-3724)

Meyer Shultz, Ph.D.
The American University, 1961

An investigation was made of a real-life situation in which failure on the official civil service tests meant the loss of a temporary Card Punch Operator position. Extra unofficial tests were also given in which there was nothing at stake. Competence was measured by a production criterion, and test anxiety by a modified form of the Sarason questionnaire.

Equivalent forms of a simplified typing test and of a name and number checking test were administered under the above two conditions of stress to 70 Alphabetic Card Punch Operators. Examinees were told that the reason for the extra tests was "to see how well they did when the pressure was off." All but two took the extra voluntary tests.

The anxiety questionnaire included questions as to whether the examinee felt more "keyed-up" on the official tests. Results were analyzed separately for the seventy per cent of the examinees who indicated that this was true. Apparently this group subjectively recognized the greater threat to their job security posed by the official tests, as contrasted to the unofficial tests.

Four hypotheses were investigated. Hypothesis I stated that there was a relationship between competence in a task and any change in performing that task under stress conditions. Hypothesis II stated that the more competent a person is in a task, the less likely is he to show deterioration under the stress of test conditions. Hypothesis III stated that persons who "blow up" under test conditions are generally the less competent even under less stressful conditions. Hypothesis IV stated that there would be a decrease in test scores when stress is reduced. In addition, the study investigated the relationships of age and educational level to other variables.

Alternate forms of the tests were shown to be equivalent. The effect of order on typing test scores was shown to be not significant by analysis of scores on previous typing tests.

Hypotheses I and II were not proved. Hypothesis III was tested in terms of passing or failing the typing test after having passed it several months before. It was proved at

the .05 level or better, for high versus low producers. This conclusion held true both for the group as a whole and also for those who reported they were more "keyed-up" on the official tests. Hypothesis IV was proved for the typing test but not for the name and number test.

The following conclusions seem justified on the basis of the experiment. The concept of the stress of test-taking as being detrimental to test performance was not supported by findings on either test. For both tests, there was a decrease in test performance when stress was reduced. This decrease was significant for the typing test. Scores on the test anxiety questionnaire had a negative relationship to scores on both tests. The linear correlations with the name and number tests were significant at the .05 level. The linear correlations with the typing tests were not significant but the correlations were shown to be curvilinear with extremes of anxiety doing most poorly. Competitors who "blew up" under the stress of the official testing had definite characteristics; they were older and were generally the less competent producers. They also tended to have extreme educational backgrounds, too little or too much compared to what was usual for their positions. These characteristics were not evident in those who failed typing in the unofficial, less stressful test situation. Microfilm $2.75; Xerox $5.80. 119 pages.

INVESTIGATION OF CHANGES IN ELECTROCORTICAL ACTIVITY DURING VERBAL LEARNING

(Order No. 61-3650)

Larry W. Thompson, Ph.D.
The Florida State University, 1961

This study was designed to investigate electrocortical changes during the learning of nonsense syllables. Hypotheses were based on recent notions concerning the reticular activating system and activation. Activation, described as a continuum from deep sleep to highly alerted states, is believed to be dependent on the amount of cortical bombardment by the reticular activating system. Extensive research evidence indicates this bombardment has some functional relationship to numerous psychological processes, such as perception and learning, as well as being crucial in the maintenance of a waking state. It has been demonstrated that activation affects the normal electroencephalogram, such that the greater the activation level, the greater the EEG desynchronization, with increased low voltage fast activity and decreased rhythmic alpha activity. It was hypothesized that the level of activation would increase as nonsense syllables were being learned, but would decline as the material became overlearned.

Seventeen undergraduates participated in the experiment. Bipolar recordings from left parieto-occipital areas were made. A major period analyzer gave a simultaneous quantitative breakdown of the primary EEG tracing. This analysis yields five measures, made available simultaneously with the primary tracing. These are: 1. Total wave count, including all waves making base line crossings, plus low voltage fast activity superimposed on larger waves. 2. Beta wave count, including waves of sufficient amplitude to make base line crossings faster than 12.5 c.p.s. 3. Alpha count, including waves between 8.5 and 12.5 c.p.s. 4. Slow wave count, including waves of slower than 8.5 c.p.s. 5. Superimposed waves, derived by subtracting all waves making base line crossings from total waves.

The experimental procedure consisted of six conditions, carried out while subjects lay comfortably with eyes closed. These were: 1. Initial rest control period. 2. ABC control period, involving presentation of the letters ABC prerecorded on audiotape at 3.8 second intervals. Subjects were requested to repeat the letters during each 3.8 second interval of silence. 3. Post ABC rest control. 4. Learning period, involving a list of 12 nonsense syllables prerecorded on tape and presented at 3.8 second intervals. Subjects were instructed to learn the list by the method of anticipation. The list was presented until one errorless trial was completed. 5. Overlearning period, involving an additional 20 presentations of the same syllables. 6. Final rest control.

Intra-subject comparisons were made between all experimental conditions on average number of waves per second for all EEG measures. Results strongly supported the hypotheses. Increased superimposed waves (significant at .001 level) and beta waves (.01 level) occurred with a concomitant decrease in alpha (.05) during learning. During overlearning, decreased superimposed waves occurred (.001 level); alpha and beta were not significant, but were in the predicted direction. Systematic changes also occurred during learning, with superimposed and beta being greatest (both significant at .001 level) and alpha being least (.05 level) during or near the period when any given syllable was first expressed correctly.

There appears to be little discrepancy between these findings and results reported from research investigating the role of activation in conditioning. This study suggests an extension of the phenomenon of activation from simple conditioning to complex verbal learning. Methodological problems were discussed. Suggestions were made for further research.

Microfilm $2.75; Xerox $6.00. 122 pages.

PSYCHOLOGICAL VALUE THEORY AND RESEARCH: 1930-1960.

(Order No. 61-3404)

John R. Tisdale, Ph.D.
Boston University Graduate School, 1961

Major Professor: William Douglas

The problem of this dissertation is to discover and analyze the meanings assigned to the term "value" in modern psychological value theory and research. To this end, both theory and research have been systematically arranged into tentative clusters or categories, each tending to emphasize a particular variable as being critical to defining values.

Group One, the first cluster, defines values as needs or need satisfactions. Maslow, Goldstein, Murphy, and Fromm show representative theoretical positions, while Maslow and White have produced corresponding research. An overview of the group suggests that while it has

difficulty in the precise formulation of basic terms and in overemphasizing, perhaps uncritically, the "objective" basis of needs, health, self-actualization, and value.

Group Two, while granting the biological basis of values, prefers to stress their motivational nature as predispositions operating prior to behavior. Spranger and Allport are the theorists of this group; Allport, Lurie, Glaser and Maller, Shorr, Bruner and Postman, the principal reseachers. The category as a whole keeps a high level of conceptual consistency and empirical verification, despite questions raised concerning aspects of Spranger's position. Most of the research in this group (and some others) has been stimulated by the Allport-Vernon-Lindsey Study of Values.

Group Three states that values arise only when problem situations demand behavioral choices. Dewey, Morris, and Woodruff exemplify this in their theory; Morris, Woodruff, Wickert, and Grace and Grace have done so in their research. It may be noted that this group implicitly assumes the highly contextual nature of values. However, some members have not always been overly consistent in their use of terms, including "choice" itself, nor does the research seem too closely related to the theory.

Group Four virtually ignores the organism and its behavior by equating values with intellectually held concepts or beliefs. There is little theoretical formulation of this, but research has been done by Hartmann, Harding, Kalhorn, and Corey. The theoretical lack might be explained by the fact that concepts are seen as having too little motivational significance, while the research presence may be connected with the relative ease of measurement of concepts and beliefs.

Group Five sees values as different kinds of situational relationships. Kŏhler, Lewin, Asch, and Murray variously suggest this theoretically, but have influenced limited research. Although there may be problems in Kŏhler's implied pluralism and Lewin's implicit reduction of value determination solely to group membership, the chief shortcoming is research scarcity. This is probably due to the definitions, which either do not sufficiently differentiate values from other types of situational relationships, or which call for the measurement of potentials instead of observables.

The initial groupings prove to have been useful chiefly to reveal seven descriptive dimensions in terms of which psychological value theories might better be described and analyzed in the future. These dimensions or issues to be considered by each psychologist in defining value might be labeled: organic connection, environmental determinants, hierarchical arrangement, motivating power, stability, experienced uniqueness, and extra-psychological grounding.

Results of the study also suggest that the communication between theorists and researchers is poor, even when the same individual acts in both capacities. Too, the value theorists studied here are not representative of the total professional psychological field, but are marked by a set of common presuppositions and resemblances to personality theorists. Finally, it is suggested that although there is no agreement on any single meaning to be given to the term "value" by psychologists, a potentially useful summary definition would be: values are inferred motivational constructs associated with perceived differences in goal-directed behavior and indicated by the selection of action alternatives within social situations. This definition certainly is as significant for what it does not say as for what it does. Microfilm $2.75; Xerox $9.25. 204 pages.

AMBIGUITIES OF LOVE: AN INQUIRY INTO THE PSYCHOLOGY OF ERICH FROMM.

(Order No. 61-3913)

Nicholas Junior Yonker, Ph.D.
Columbia University, 1961

Man's freedom, according to Fromm, results from his emergence from an original oneness with nature and the primitive community. He draws a close parallel between the growing freedom of the human race and that of the individual emerging from the matrix of the family. In both cases, individuation is ambiguous; it creates the possibility for greater self-strength, but it also makes possible a growing aloneness. Consequently, the way in which man relates to his world becomes all important. Man can unite himself with the world in the spontaneity of love and productive work or else he can seek forms of security which destroy his individual freedom and integrity. A number of destructive personal and political relationships are formulated. These are followed by a discussion of the productive personality which retains its independence and yet relates to the world with love and reason.

In contemporary thought, love for one's self and love for one's neighbor have generally been regarded as opposed emotional vectors. Freud's presupposition of a fixed amount of libido follows this view. The more love that one directs toward another person, the less one has for himself, and vice versa. Fromm challenges this position by distinguishing between selfishness and self love. The former develops as a compensatory mechanism for a lack of genuine self love whereas the latter is the actual base for a sound love of others. Fromm interprets the Biblical injunction to "love thy neighbor as thyself" as implying that the love and respect given to other individuals cannot be separated from the love and respect that one feels toward one's self. Genuine love is an active striving for the growth and happiness of the loved person, rooted in one's own capacity to love. It is an expression of productiveness and implies care, respect, responsibility and knowledge. The great "normative humanists" of various cultural traditions have manifested these productive traits.

Fromm's views on love are then contrasted with the Christian perspective of Reinhold Niebuhr and the Freudian perspective of Herbert Marcuse. Niebuhr accents the sacrificial, self-giving aspects of love and is generally skeptical of any usage of the phrase self-love. Nevertheless, similarities are found between Fromm's usage of the term "self-love" and Niebuhr's concept of "grace." Marcuse criticizes Fromm for having denied the instinctual base of human love. This denial robs the Freudian critique of society of its explosive content. Fromm counters by insisting that Freud over emphasized the power of sexuality and repression in both the individual and culture. In a comparison of the three thinkers, Niebuhr's critique of utopianism is found to be relevant to both Fromm and Marcuse.

There follows a more detailed critique of Fromm's view of the human situation, self love, and neighbor love. Fromm does not adequately relate his concept of social process to his concept of an essential and normative human nature. At times, the social process appears all encompassing and this leads to an even more relativistic view than the Freudian position that Fromm criticizes. However, Fromm attempts to counter this tendency with his view of a real self which is good and normative but which

is perverted and alienated by various social structures. His views of the self and society are shown to be over simplified and misleading. His utopian revision of the social structure is based on a naive view of the self. In actuality, such revisions would require authoritarian practices for their fulfillment.

The author juxtaposes a formative humanism to Fromm's normative humanism by proposing a symbol complex which evokes behavior patterns that are essential to the emerging world community.

Microfilm $4.40; Xerox $15.55. 342 pages.

PSYCHOLOGY, CLINICAL

CONSISTENCY VERSUS INCONSISTENCY OF DEFENSIVE BEHAVIOR

(Order No. Mic 61-1054)

Arthur Morris Anton, Ph.D.
The University of Buffalo, 1961

The present investigation was concerned with the consistency of defensive behavior. An attempt was made to determine whether or not a single mode of defense is employed in connection with three separate situations in which a given threatening "need" area is encountered. This issue was approached by means of the following experimental situations in which S encountered a "need" area which was presumably threatening: a) a perceptual situation in which S was required to recognize tachistoscopically-presented words representative of sexuality or hostility; b) a memory situation in which S was required to recall certain words in a passage containing a sexual or a hostile theme; c) a judgment situation in which S was instructed to check adjectives which he considered to be most accurately descriptive of a character portrayed in a passage with a sexual or a hostile theme. Control stimuli were also presented in connection with each situation. In the present investigation, an attempt was also made to reinforce a position suggested by certain findings obtained by Wiener, Carpenter, and Carpenter (1956) – namely that consistency and inconsistency in defensive behavior, from sexuality to hostility, occur with approximately equal frequency.

Two sentence completion tests were used to classify Ss according to defense types. One was designed to tap the use of "repression" and "sensitization" with respect to the conflict-area of sexuality; the other presumably tapped the use of these defenses with reference to hostility. Both sentence completion tests were given to 568 Ss. For each conflict-area, three groups were selected from the total sample. These were: a) twenty sensitizers; b) twenty repressers; c) twenty "ambidextrous defenders," Ss who presumably used sensitizing and repressive defenses with equal facility.

Predictions were made from sentence completion test results to behavior in the experimental situations. For each conflict-area, it was predicted that sensitizers would be more sensitive to conflict material encountered in all three situations than would repressers and ambidextrous defenders, and that ambidextrous defenders would be more sensitive to conflict material than would repressers.

The findings failed to confirm the predictions and thus failed to indicate that a single mode of defense is employed in connection with three situations in which a given threatening "need" area is encountered. However, when defensiveness was defined in terms of intra-group differences between performance on the conflict and on the control stimuli of a given situation, all of the groups exposed to the hostility materials gave evidence of defensiveness with regard to hostility in perception and memory. In the perceptual situation, repressiveness was found. In the memory situation, sensitization was found. Thus for hostility the results supported the inconsistency hypothesis. In the conflict-area of sexuality, sensitizing defenses were used in connection with judgment and memory. However, it became apparent that sensitization presents two aspects – one which produces enhanced accuracy of response and another which causes a person to "read into" a situation more threatening elements than are present. The aspect of sensitization which manifested itself in judgment differed from that found in memory. Thus the findings pertaining to sexuality suggested that despite a generalized tendency to employ sensitization there was inconsistency, from one situation to another, with reference to the aspect which was manifested.

It was intended that, after obtaining evidence of the validity of the sentence completion tests, sentence completion test data would be used to determine whether or not consistency and inconsistency of defense, from sexuality to hostility, occur with approximately equal frequency. Since the predictions were unconfirmed, the validity of the sentence completion tests was not demonstrated. Thus consistency of defense, from one conflict area to another, could not be approached meaningfully.

Microfilm $2.75; Xerox $7.20. 151 pages.

THE ABILITY TO IDENTIFY EXPRESSIONS OF FEELINGS IN VOCAL, GRAPHIC, AND MUSICAL COMMUNICATION.

(Order No. 61-3416)

Michael Beldoch, Ph.D.
Columbia University, 1961

Although there has been considerable interest through the years in the ability to identify emotional communication in a variety of media, there has been no research on the interrelationships that exist among abilities to identify such communications in different media. It was the central purpose of this study to examine such relationships by means of a cross-validation study.

Tape recordings of male and female speakers reciting the same neutral paragraph in an attempt to communicate various emotional states were presented to evening college students on two separate occasions. Item analyses of responses to the tapes were conducted and a final tape developed which included only items which were more often identified as the speaker's intended emotion than any other choice. A similar technique was used with recordings of musical phrases created and played by musicians in an attempt to communicate the same emotions. Abstract art

created by artists to convey these emotions was shown by opaque projection to still another group of evening students and the same criteria used to select items that successfully communicated the artist's intention. Reliability coefficients for each instrument were in the .60's and .70's indicating that the ability to identify the communication of feelings in the separate media is a relatively stable phenomenon.

The final study presented to 89 men and women graduate students in Teachers College tape recorded speech selections and musical phrases, opaque projections of abstract art, a 300 item adjective check list, and a questionnaire which elicited background information with regard to the Ss training, participation in and enjoyment derived from the separate media. A six step self-report scale of sensitivity to other peoples' emotional expressions and a 40 word vocabulary test as a measure of intelligence completed the materials used in this study.

Significant intercorrelations were obtained among the abilities to identify the expression of feelings in all three media. Vocabulary scores also correlated significantly with ability in all three modes and with total score, although when controlling for vocabulary scores, two of the three significant relationships among abilities in the three media remained significant. Background training or current interest in the arts did not contribute to success with any of the instruments. None of the adjectives on the check list discriminated between high and low scorers on the sensitivity measures, but self-reported sensitivity did distinguish between groups, the high scorers describing themselves as more sensitive than the low scorers.

The results of the study were discussed in terms of Langer's distinction between discursive and nondiscursive symbolic activity. Intelligence is most often measured by tasks in the discursive mode, such as knowing the meaning of words. Nondiscursive symbols, on the other hand, are communicated by their formal properties, and are the kind used by artists and in the process of intuition. This research suggests that abilities in the discursive and nondiscursive modes have some common variance, but that they are in many ways independent of each other. The implications for further research focus on understanding the correlates of ability in the nondiscursive mode, especially as they may relate to cognitive and conceptual function and malfunction. The possibilities of understanding aspects of psychopathological behavior in terms of an inability to integrate nondiscursive and discursive communication were discussed, as well as the possibility that "clinical sensitivity" may be measurable by ability in the nondiscursive mode.

Microfilm $2.75; Xerox $3.00. 60 pages.

PSYCHOTOXIC EFFECTS OF SCHIZOPHRENIC PLASMA IN THE RAT

(Order No. 61-3592)

Melvin Puckett Bishop, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor George E. Copple

This study investigated hypothesized psychotoxic effects of blood plasma from schizophrenic patients in the albino rat. Effects of intraperitoneal injections of heparinized plasma from schizophrenic and control donors upon the learning and retention of an instrumental avoidance response were measured. Hypotheses predicted: impairment of original learning of the avoidance response following injection of schizophrenic plasma; no effect of either schizophrenic or normal plasma upon retention of the avoidance response; and no impairment of learning with injections of plasma from non-normal control subjects.

Significant impairment of learning was found with injections of plasma from both acute and chronic schizophrenic patients. No difference between the schizophrenic and normal groups were observed in the retention of the avoidance response. The differential effects of schizophrenic plasma upon learning and retention were considered in relation to data for laboratory conditioning and for learning in schizophrenia.

Effects in the animals of plasma injections from individuals with non-schizophrenic neuropsychiatric disorders and with chronic physical illnesses, although not sufficiently different from those with injections of normal plasma or saline to reject the null hypothesis, suggested the possibility of some learning impairment following these non-normal control injections. Findings for these groups were thus considered inconclusive.

Degree of learning impairment resulting from injections of acute schizophrenic plasma did not differ from that with plasma from chronic schizophrenic patients, suggesting that the toxic effect of schizophrenic plasma cannot be attributed to variables associated with long-term institutionalization.

No group differences in degree of "emotionality" were observed among animals injected with plasma from the various donor types. There was, however, a statistically significant failure on the part of the schizophrenic plasma animals to display the inverse correlation between emotionality and rate of learning shown by the control groups. Interpretation of this non-hypothesized finding was withheld pending confirmation in replicative studies.

The avoidance learning data, despite clearly divergent group results, revealed considerable overlap between the normal plasma and schizophrenic plasma injected groups. Results do not permit straightforward interpretation of this aspect of the findings. The possibility that some schizophrenic plasma samples produced no impairment was considered, as were other alternative explanations of these data.

Biographical and psychometric data for the chronic schizophrenic donors failed to differentiate between those subjects whose representative animals learned the avoidance task to criterion and those whose animals failed to learn. Possible explanations for this suggested lack of relationship in schizophrenia between severity of behavioral symptoms and "potency" of the plasma factor were offered.

Results are interpreted generally as providing evidence for the presence of a psychotoxic substance in schizophrenic blood, and as supporting at the animal level Heath's taraxein findings in humans. While this toxic agent is apparently not present in the blood of normals, the present data provide no conclusive evidence that it is specific to schizophrenia. The need for further investigation on this specificity issue was emphasized, and various considerations relative to future research in this area were presented. Microfilm $2.75; Xerox $5.40. 106 pages.

HOSTILITY IN CHILDREN WITH IDIOPATHIC EPILEPSY

(Order No. 61-3392)

Arnold Bookspun, Ph.D.
Boston University Graduate School, 1961

Major Professor: A. William Hire

The purpose of this study was to investigate repressive handling of conflicts around hostility in epileptic children.

There has been a considerable amount of evidence, from clinical material, of severe conflicts around hostility in epileptics. It has been further indicated that epileptics utilize repressive methods of handling the conflicts and that they appear to be in a pent-up state emotionally. It has been demonstrated, from previous research, that conflict in a given area, which is handled by repressive methods of defense, will lead to the inhibition of learning of material related to the conflict.

The general hypothesis formulated from these considerations was that epileptics would show cognitive inhibition of material with a hostile connotation and would show increased cognitive inhibition when hostility was induced.

An epileptic group of twenty-five children and a normal group of thirty-two children, of ages seven-and-a-half to twelve-and-a-half, were selected. They were given the Rorschach Test followed by four word lists, two consisting of neutral words and two of hostile words, presented on a Gerbrand's design memory drum. The method of serial anticipation was used in presenting the lists. Half of each group was criticized before the second pair of lists was presented, in a manner calculated to induce hostility.

The operational predictions were as follows:

Prediction 1. The epileptics will require more trials than will the normal group in learning the hostile list of words before hostility is induced.

Prediction 2. The epileptic and normal groups will require more trials in learning the second list of neutral words after hostility is induced.

Prediction 3. The epileptic and normal groups will both require more trials in learning the second list of hostile words after hostility is induced.

Prediction 4. The normal group will have equal difficulty in learning the second neutral and hostile lists after hostility is induced.

Prediction 5. The epileptic group will require more trials in learning the second list of hostile words than the second list of neutral words after hostility is induced.

The results of the experiment supported only the fourth prediction, which was not a central one in the study. Further statistical analyses, which took into account hostile drive strength scores as well as management of hostility and rate of learning, also failed to show group differences in these measures or differential learning of the hostile and neutral material within or between the two experimental groups. Criticism of performance was found to have a significant detrimental effect on the learning of the second hostile list but not on the second neutral list, when the data for all subjects were combined.

Thus the clinical finding of repressive handling of conflicts around hostility in epileptics was not experimentally confirmed in children with idiopathic epilepsy. The results of the present study do not disprove the possibility that hostility is involved in the development and precipitation of seizures, but they do indicate that children with idiopathic epilepsy do not show significant differences from normal children on measures of hostile drive strength or of the management of hostility. The findings leave open several possibilities for alternative explanation of the relationship between hostility and epilepsy. One among such alternatives is that of a hypothesis which would relate hostility to a more immediate and direct discharge in a seizure than would be involved in the repression hypothesis.

Microfilm $2.75; Xerox $5.60. 112 pages.

HOSTILITY AND JEWISH GROUP IDENTIFICATION

(Order No. 61-3389)

Leon Oscar Brenner, Ph.D.
Boston University Graduate School, 1961

Major Professor: Charles N. Leef

This study is concerned with an investigation of hostile expression and Jewish group identification. The design of the study included the development and factor-analysis of a scale of Jewish identification. Specifically, the study dealt with four main issues: the relationship between Jewish group identification and the expression of hostility, a comparison of hostile expression in Jews and non-Jews, an investigation of the multi-dimensionality of Jewish group identification, and a study of the relationship between the derived factors of Jewish identification and the expression of hostility.

Based upon the writings of various authors in the fields of clinical psychology, social psychology, and psychoanalysis, as well as clinical observations, assumptions were made concerning the relationship between Jewish group identification and hostile expression. Previous studies led to the development of a conceptual model to explain extremes of Jewish identification. The theoretical formulations and clinical studies led to the following hypotheses:

1. There is a curvilinear relationship between hostility and Jewish group identification.
2. Jews as a group show less hostile expression than non-Jews.
3. Jewish group identification is multi-dimensional

Three hundred adult Jewish males selected from the general population served as the research sample. Each subject was given two attitude inventories to complete, as well as a face sheet of social information. The inventories consisted of the Scale of Jewish Identification, and the Buss-Durkee Hostility Inventory. Each subject's Hostility Inventory was scored for eleven hostility scores. The Scale of Jewish Identification was scored for total identification, and was subjected to a factor-analytic procedure to extract factors tapping different dimensions of Jewish identification.

For the purpose of this study, Jewish group identification was operationally defined as the total score on the

Scale of Jewish Identification. Hostile expression was defined as the score on the B-D Hostility Inventory.

The statistical procedures utilized to test the hypotheses were analysis of variance, t tests, and correlation ratio (eta). Factor-analysis and product-moment correlation techniques were utilized to obtain the rotated factors.

The results of the study confirmed all hypotheses.

Hypothesis 1: the correlation ratio between Total Hostility and total identification was significant at the .01 level.

Hypothesis 2: the t tests between the Jewish and non-Jewish samples on Total Hostility were significant at the .0005 level.

Hypothesis 3: the intercorrelations among the rotated factor scores of Jewish identification indicated the appropriateness of treating Jewish identification as a multi-dimensional concept.

A formulation of the results of the study suggests the following conclusions:

1. Within the Jewish group, those individuals with extremely low and high identification manifest significantly lower hostile expression than do the individuals comprising the intermediate range of identification.

2. As a group, Jews manifest significantly less outward expression of hostility than non-Jews.

3. Jewish identification must be viewed multi-dimensionally, with not only several facets comprising this identification, but also features of ambivalent attitudes within the several dimensions.

The relationship between the rotated factors of identification and the expression of hostility corroborated the first hypothesis, which predicted lower hostile expression in the extremes of identification and higher hostile expression in the intermediate range.

Discussion of the results presented indications for further research. These included further refinements in the clarification of the factors of Jewish identification. Some speculations were offered concerning the issue of internalized hostility in the high and low groups of Jewish identification. Further speculations were made concerning the relationship between Jewish over- and under-identification and Jewish anti-Semitism.

Microfilm $2.95; Xerox $10.35. 228 pages.

THE DIRECTION OF AGGRESSION IN CLINICALLY DEPRESSED WOMEN

(Order No. Mic 61-1565)

Reverend Jaime Carlos Bulatao, S.J., Ph.D.
Fordham University, 1961

Mentor: Rev. William G. Lawlor, S.J., Ph.D.

Many clinicians, particularly those of the Freudian school, have maintained that in mental patients suffering from depression there is an underlying turning of aggression against the self. The present research was an attempt to apply experimental methodology to test this observation.

The experimental design consisted in testing a patient when depressed, and retesting him after the depression had been lifted by a series of electroshock treatments. Any change in the direction of aggression could thus be observed. A control group was used to eliminate the "normal" change of scores caused by a second taking of the same tests.

The experimental subjects were forty hospitalized women, between the ages of 20 and 55, who were judged by two psychiatrists as manifesting depressive symptoms, and for whom electroshock was accordingly prescribed. They were matched individually for age and WAIS vocabulary with forty normal, female, hospital workers. Like the patients, the control subjects were tested twice, with an interval approximating that of the patient group.

Five tests were given, each yielding two scores, on the attitudes towards the self and towards another. These tests were:

1. The Semantic Differential Test. This test yielded a "value" score on the self and on the person whom the patient "liked most and could depend on."
2. The Semantic Differential Test in combination with the Draw-a-Person Test. The "objects" rated were a drawing by the patient and one prepared by the experimenter.
3. The Leary Interpersonal Checklist. The "Lov" dimension was scored for the self and the other.
4. A Social Desirability Scale. The scale was the sum of weights attached to the items on the Leary Interpersonal Checklist.
5. The Rosenzweig Picture-Frustration Study. The test yielded extropunitive and intropunitive scores.

The data were analyzed by subtracting each score at first testing from the corresponding score at second testing. The difference-scores of each control subject were then subtracted from those of the matching patient. The final difference scores, representing the change in the direction of aggression as a correlate of the lifting of depression, were tested for significance against the null hypothesis.

A significant decrease in intropunitiveness was indicated by the Semantic Differential Test (.001), the Social Desirability Scale (.05), and the Rosenzweig P-F Study (.05). A significant increase in extropunitiveness was indicated by the Semantic Differential Test (.01), and the Rosenzweig P-F Study (.01). A reversal in the originally hypothesized direction occurred where the Semantic Differential Test was used to rate the drawing prepared by the examiner (.05).

The main hypotheses of the experiment seemed thus to have been confirmed, namely that, with the lifting of depression by electroshock, intropunitiveness would decrease and extropunitiveness would increase. A qualification is made that the rise in the Semantic Differential Test's value score and the Social Desirability Scale, where these used "self" as "object," is open to an alternate interpretation. This rise may be in part an objective evaluation of the patient's improved condition, and need not be a purely subjective decrease in intropunitiveness. Nevertheless, such an interpretation would not contradict the more psychoanalytic interpretation of the entire data. The fact that the test scores changed in the direction that had been predicted from theoretical grounds under the psychoanalytic theory serves as a confirmation both of the theory and of

the "validity" of the tests. The main conclusions of the experiment are that, as correlates of the lifting of depression in women patients, 1) intropunitiveness decreases, and 2) extropunitiveness rises.

Microfilm $2.75; Xerox $4.40. 81 pages.

PERSONALITY CHARACTERISTICS AND CHILD-REARING ATTITUDES OF FATHERS OF SCHIZOPHRENIC PATIENTS

(Order No. 61-3235)

Saied Shamlu Farahmand, Ph.D.
Washington State University, 1961

Chairman: Joseph F. Rychlak

The general aim of this study was to investigate, by means of objective methods, the problem of personality characteristics and child-rearing attitudes of the fathers of schizophrenic patients. Two hypotheses about the personality characteristics and child-rearing attitudes of fathers of schizophrenics were formulated. The first hypothesis claimed that the personality characteristics of fathers of schizophrenic patients were uniformly different from those of the fathers of nonschizophrenics (normal individuals). The second hypothesis proposed that the child-rearing attitude of the fathers of schizophrenic patients were uniformly different from those of the fathers of normals.

Twenty fathers of adult schizophrenic patients were compared with 20 fathers of normal individuals. The control group was composed of the brothers of the experimental group. The schizophrenic patients were divided equally by sex. Eight subjects were from the Illinois Neuropsychiatric Institute, and 32 were from the State Hospital North in Idaho. The subjects (fathers of patients and/or normals) were all white male, drawn from fairly similar socio-economic background. The two groups of fathers were all under 65 years of age.

Objective tests were used in the study of personality characteristics and child-rearing attitudes of fathers in order to provide a more objective basis for conclusions than most of the previous studies. Before the tests were administered there was a brief interview for purposes of obtaining more information on certain variables dealing with the father-child relationship, and establishing rapport. The "Vocabulary" subtest of the Wechsler Adult Intelligence Scale was used for estimating the intelligence of the fathers. The personality test used was the Minnesota Multiphasic Personality Inventory. The Parental Attitude Research Instrument was used to determine the child-rearing attitude of subjects.

The patients whose fathers were studied were all white, hospitalized patients. They were diagnosed as paranoid schizophrenics by the consensus of the hospital staff and on the basis of their scores on the MMPI. If the MMPI were invalid, the diagnosis was based on the opinion of the hospital staff. The nonschizophrenic offspring were all making a satisfactory adjustment, as judged by their father's evaluation. They were comparable to the patients' group with regard to age and socio-economic status. Special care was taken to include only fathers who had lived at home through the adolescent period of their offspring.

The two hypotheses were tested by comparing the results of the performance of the two groups on the objective psychological tests and the interview questionnaire chi-squares. F-tests of variance and t tests of differences between the means were computed. The results from the MMPI and the questionnaire failed to clearly support the first hypothesis that there are certain personality characteristics shared by the fathers of schizophrenic patients, which distinguish them from the fathers of nonschizophrenics. The findings from the questionnaire suggest that family relations are more harmonious for the control group in that the parents of normals do many things together and these children feel free to confide in their parents.

The most positive findings come from the results of the Parental Attitude Research Instrument. These results indicate that the child-rearing attitudes of fathers of schizophrenic patients show them to be more aggressive, punitive, and demanding than those of fathers of normal individuals. Fathers of normals manifested emotions such as love, acceptance, confidence, comradeship, and permissiveness significantly more often than their brothers. The complex question of father-child relationship needs was discussed and further research suggested.

Microfilm $2.75; Xerox $5.00. 98 pages.

LIMITED GOALS IN SHORT-TERM GROUP PSYCHOTHERAPY WITH INSTITUTIONALIZED ADOLESCENT DELINQUENT BOYS

(Order No. 61-3877)

Simon Maurice Feder, Ph.D.
Columbia University, 1961

The purpose of the present study was to investigate the effectiveness of short-term discussion group psychotherapy with institutionalized delinquent adolescent boys with reference to three limited goals.

It was hypothesized that an 8-week, 16-session group therapy experience would (a) promote therapeutic readiness, (b) facilitate institutional adjustment, and (c) stimulate school achievement. Forty boys who participated in the treatment process were compared with 20 boys who received no professional contacts beyond routine diagnostic procedures and with 20 boys who participated in an educational group. Six indices were used to describe the three dimensions of hypothesized changes.

The results showed differences among the groups only in therapeutic readiness. The experimental groups exhibited greater readiness, while the control groups showed no increase in readiness.

The present finding was interpreted as suggesting that short-term group therapy may serve as a foundation for later, more profound changes with continued treatment. This possibility was considered consistent with theories of psychotherapy as a learning process, developing out of an awareness of the need for change and involving a sizeable period of time for fruition. Whether or not more extensive change is capable of being achieved by the technique remains to be demonstrated by further research.

Among other results, the criterion validity of a new instrument to measure therapeutic readiness was demonstrated. It was also shown that the two experimental groups, though led by different therapists, showed the same pattern of change. Another finding was that group therapy effected change in therapeutic readiness, but group work did not. The question of whether this specific superiority of group therapy is generalizable to other personality changes or not was raised and left to future research. It was also noted that the problem of delineating the precise processes by which groups produce changes in their members was not dealt with, because outcomes and not processes were the focal point of this investigation.

Two unpredicted findings were noted and recommended for cross-validation. They were that more silent therapy group members did not show as much gain in therapeutic readiness as more talkative group members, and that therapy group members seemed to show less inclination to flee the institution than non-therapy subjects. Both observations were felt to have implications, if upheld, for group therapy theory and technique.

Finally, the correlates of positive gain in therapeutic readiness were examined with the available variables. The only suggestion from the present data was that younger boys show more marked gains, probably because when they first experience the technique, their readiness for it is initially less than that of older boys.

Microfilm $2.75; Xerox $4.00. 72 pages.

THE EFFECT OF SINGLE VERBAL STIMULI AND COMBINATIONS OF VERBAL STIMULI ON EMISSION OF A CLASS OF WORDS OR SENTENCES

(Order No. 61-3635)

Samuel J. Fletcher, Ph.D.
The Florida State University, 1961

An experiment was conducted to investigate two variables in verbal conditioning:

1. A possible differential effectiveness as reinforcers of different verbal stimuli, both individually and in combinations.
2. A possible differential effectiveness as reinforcers of verbal stimuli on different response classes.

Ten Ss were assigned at random to each of 16 groups. Eight groups of Ss said individual words for 30 minutes. Ss in the other eight groups made up a sentence from each of 120 cards. Each card contained six personal pronouns (I, We, You, He, She, They) and three past indicative verbs. S used one of each in his sentence.

Three verbal stimuli, "mmm-hmm," "alright," and "good" were used. Each of the three stimuli was used alone in a group saying words and a group saying sentences. Combinations of two of the three stimuli were used for three more groups saying words and three more saying sentences. All three stimuli were used with a seventh group in both experimental conditions. The eight group of Ss in each condition was the control.

A verbal stimulus was spoken by E each time an S in an experimental group saying words said a plural noun during the first 15 minutes. E also spoke a verbal stimulus each time an S saying sentences began one of the first 60 sentences with "I" or "We." The stimulus spoken by E was alternated at random for groups employing two or three verbal stimuli. E remained silent during the last 15 minutes an S said words and for the last 60 cards for an S saying sentences.

All Ss were questioned after the experiment as to their awareness of the verbal stimulus-response class relation. Two Ss saying words and 21 Ss saying sentences were replaced in the experiment upon verbalizing the correct relation.

Analyses of variance on the number of plural nouns emitted by Ss saying words revealed no significant difference during either the first 15 or last 15 minutes. Similar analyses on the number of sentences beginning with "I" or "We" emitted by Ss saying sentences revealed no significant difference during either the first 60 or last 60 cards. A t test showed verbalizing Ss making up sentences were not significantly different from nonverbalizers in the number of sentences beginning with "I" or "We." However, a t test comparing control Ss and verbalizing Ss on this same variable on the first 60 cards was significant ($p<.02$), though a similar test was not significant for the last 60 cards ($p>.05$).

Several possible explanations for the discrepancy between the results obtained in this experiment and the results reported by other experimenters were considered. The explanations suggested included the following:

1. Sampling error inflating the frequency of plural nouns in the control group. An additional control group was run and failed to support this possibility.
2. E furnishing some unknown cue to Ss in control groups which tended to increase their production of plural nouns. In an effort to evaluate this, two more control groups were run, using a different E in each. The results failed to support the possibility of such a cue being given by E.
3. Lack of naivete of Ss for verbal conditioning experiments. The conditions under which Ss were run in the additional control groups mentioned seemed to preclude this.
4. Personality variables of S and E or the interpersonal relationship between them resulting in a failure to obtain conditioning.

It was concluded that a thorough investigation was needed to locate the basic variables involved in verbal conditioning in order to minimize conflicting results in verbal conditioning research.

Microfilm $2.75; Xerox $3.00. 45 pages.

DELAY OF RESPONSE IN PROBLEM SOLVING AND COLOR RESPONSE TO RORSCHACH STIMULI

(Order No. 61-3368)

Harwant Singh Gill, Ph.D.
Boston University Graduate School, 1961

Major Professor: A. William Hire

Introduction

This study examined the relationship between delay of response in problem-solving and ability to integrate color and form on a perceptual task. It was an attempt to relate a perceptual process to a personality variable, and thus make meaningful certain individual differences in perceiving in terms of more general principles of ego controls.

Theoretical Background

The hypothesis was derived from Rapaport who, in the interpretation of the Rorschach, considers psychological functions involved in the process of responding to the inkblots. These psychological functions are in turn embedded in the framework of psychoanalytic ego psychology, more specifically, psychoanalytic theory of thinking.

According to Rapaport, the form-color response (FC) involves an ability to delay response until a suitable percept integrating the color of the inkblot with its form is available to the subject, while the pure color (C) and the color-form (CF) responses fail to achieve adequate integration of the color with the form because of insufficient delay.

If delay of response is the crucial variable differentiating between the various modes of handling color on the Rorschach, we should expect that the people characterized by ability to delay response in problem-solving would tend to give FC responses, while those unable to exercise delay would tend to give CF & C. In this study, delay of response was defined in terms of both speed and accuracy of response.

Procedure

A 25-item problem-solving task, the Mirror Task, was devised by the investigator. This task consists of geometric or alphabet-like figures, which have to be recognized in the form they would appear in a mirror. A correct solution of these problems often requires some delay of response, so that speed of response on this task can often make an appreciable difference in accuracy of response.

The problem-solving task was administered twice to 305 students in small group-sessions. The first administration was done with problems projected on a screen so as to control speed of response. The second administration used a booklet form of the task and students were allowed to finish the task in as much or as little time as they needed. The differential increase in accuracy scores achieved on the second administration was found to be at least partly a function of different amounts of time spent. Fifteen individuals spending minimum time and achieving minimum score increase were selected to constitute the experimental group manifesting lack of response delay. Fifteen other individuals spending maximum time and achieving maximum score increase constituted the second experimental group, those able to exercise delay of response.

The 30 experimental subjects were administered a modified form of the Rorschach. This perceptual task consisted of 15 chromatic large detail areas (D) found fruitful in eliciting FC as well as CF & C responses. This modification in the Rorschach administration was deemed necessary in order to increase the number of color responses. Two successive administrations of the 15 selected locations yielded a total of 30 responses per subject, of which on an average about one-third were color-determined.

Results

A statistical analysis of the color scores revealed that the predicted FC, CF, and C differences between the two experimental groups reached .01, .001, and .0003 levels of significance respectively.

The research hypothesis was supported by the results of this study, and it was concluded that the people characterized by inability to delay response in problem-solving are, on a perceptual task like the Rorschach, less capable of integrating the color of a stimulus with its form properties as compared to those who are characterized by delay of response. Microfilm $2.75; Xerox $6.80. 142 pages.

PEER RELATIONS AND BODY-IMAGE MATURITY IN CHILDREN

(Order No. 61-3408)

Jane Elizabeth Hulek, Ph.D.
Boston University Graduate School, 1961

Major Instructor: Austin W. Berkeley, Ph.D.

This study was based upon a general proposition derived from psychoanalytic theory that there would be associations of interpersonal aspects of object relations with body-image concepts and with learning provided chronological age and mental ability were controlled. Hypotheses were investigated in latency children at one developmental level by means of testing a differential association of relative isolation-nearness in peer relationships with maturity of body image as projected in human-figure drawings. Standardized measures of isolation-nearness were constructed from sociometric criteria rated by peers within classrooms. Body-image-maturity measures were derived from ratings of serial human-figure drawings: Good-enough drawing mental age; and quality and integration on a composite error-distortion-omission (CEDO) scale constructed for this study. Mental ability and learning were measured by median scores on standardized group tests: Kuhlmann-Anderson and Stanford school achievement, respectively.

The experimental sample consisted of 117 third-grade pupils (57 boys, 60 girls) constituting five classrooms from urban public schools situated in neighborhoods of differing but largely middle-class socioeconomic status. Three classrooms were homogeneous in religious affiliation. Mean mental ability was high average.

Drawing media were free choice of crayons and pencil following experimentation in a group of 160 second-through-fourth-grade children: correlations ranged above .92 between Goodenough scoring of man-drawings in crayon only and in pencil only.

Predictions called for various correlational analyses of the six major variables. Findings substantiated the prediction that subject selection at one developmental level would control effects of chronological age.

Findings substantiated the prediction of an association of body-image concepts and isolation-nearness. Drawing quality was a better predictor of isolation-nearness than was drawing mental age. Despite significant associations between the drawing scales, when chronological age and mental age were held constant, there were no longer any significant associations of isolation-nearness and drawing mental age, whereas associations of isolation-nearness and drawing quality were significant at better than the .01 level in both sexes.

There were sex differences in drawing quality and in relationships among variables. Drawing mental age fell below mental ability in boys and exceeded mental ability in girls, suggesting that developmental norms may need restandardizing by sex. Photographs of drawings of 3 pairs of cases matched for sex, chronological age, and mental age, but of contrasting sociometric status, illustrated the better quality drawings associated with greater nearness in peer relationships.

Findings substantiated the prediction of an association of body-image concepts and learning to a limited degree. The positive association of drawing mental age and school achievement was significant only in sexes combined. Drawing quality and achievement were positively associated in boys, but not in girls. However, higher mental ability and better drawing quality were more highly associated in boys than in girls. There were positive associations between nearness in peer relationships and achievement in both sexes, but isolation-nearness bettered the prediction of achievement beyond that made by mental ability only in sexes combined. It was suggested that hypotheses concerning learning and body-image concepts be tested using larger numbers of seriously-underachieving children than were in this sample.

Conclusions were: drawing quality was the most sensitive index of relative isolation-nearness in peer relationships; a qualitative assessment of human-figure drawings is relevant to understanding the social functioning of the third-grade child; the association of better quality and integration in human-figure drawings with greater nearness in object relations strengthens the hypothesis of body-image projection in human-figure drawings.

Microfilm $3.75; Xerox $13.30. 291 pages.

LEVEL OF ASPIRATION IN TWO TYPES OF DELINQUENTS

(Order No. 61-3400)

Roy Max Kahn, Ph.D.
Boston University Graduate School, 1961

Major Professor: Murray L. Cohen

The specific focus of the present study is the ability of different types of delinquents to utilize authority-mediated informational cues based on different social referents to modify their ideal goals. Both clinical and empirical research have provided bases for classifying legally adjudicated delinquents into psychologically different groups in terms of their ego functioning. The behavior of "character disorder" delinquents suggests severe distortion of normal ego development and reflects the continuing operation of genetically early-occuring forms of self-oriented ego functioning, including believed-in omnipotence and the rejection of other persons as trustworthy sources for reality testing. The behavior of "neurotic" delinquents is suggestive of the presence of genetically later ego mechanisms set in an ego which is also generally mal-developed. Though acting omnipotent, they tend to over-value the opinions of others, seeing these as demands they must fulfill. Viewed psychoanalytically, these two types of delinquents vary as to course of ego development, presence and functioning of certain ego mechanisms, and the extent of relationship and ego involvement with others. Non-delinquent ego development, in contrast, entails the abandonment of omnipotence functioning and the establishment of meaningful relationships to others based on adequate reality testing and trust. On the basis of psychoanalytic constructs derived from the behavior of the two types of delinquents, it might be expected that their reactions to information embodying the referents "self" and "others" would be different. Further, the delinquents' omnipotent-like behavior would suggest that they might set different initial goals from the more realistic non-delinquents.

Two experiments were performed. The technique of level of aspiration was employed to measure the extent of ego-involvement of the delinquents with each of the referents underlying the informational cues. Forty adolescent male delinquents were classified as "character disorder" delinquents, and 40 adolescent male delinquents were classified as "neurotic" delinquents on the basis of their histories of delinquent activity and the age at which such activity began. An additional 40 adolescent male non-delinquents served as controls. The subjects were divided at random into six groups, one group from each class being represented in each of the two experiments. Subjects in each experiment were equated for age, intelligence and socio-economic status.

A modified rotor-pursuit task was used as the basis for obtaining an initial (uninformed) level of ideal goal aspiration from each child in the experiments, (N=120). In Experiment I, 20 children from each of the classes were then informed individually that they had achieved 50 percent of their initial aspiration, and a new level of aspiration was obtained. In Experiment II, 20 other children from each of the classes were informed individually that "other boys your age" usually achieved 50 percent of the initial aspiration they each had given previously, and a new level of aspiration was obtained.

Five predictions were tested: 1. Delinquents would establish higher initial aspirations than non-delinquents. 2. No differences would exist between the three classes in amount of change in aspiration level induced by information based on the referent "self." 3. "Character disorder" delinquents would alter their aspirations less than the other two classes in response to information based on the referent "others." 4 and 5. The direction of change in aspiration would be congruent with the nature of the information presented.

Analysis of the data demonstrated that delinquents establish higher initial aspirations than non-delinquents. In addition, "character disorder" delinquents establish higher aspirations than "neurotic" delinquents. These findings were interpreted as supporting psychoanalytic postulates concerning the need to appear omnipotent in delinquents. The data suggested that "character disorder" delinquents favor the highest, most impossible, goals, while "neurotic" delinquents, though unrealistic, aim lower, perhaps as a reflection of better reality testing and perhaps as a function of the need to communicate inadequacy while still fulfilling their misconception of what others are demanding from them.

Comparison of the amount of change in aspiration induced by information established that there were no significant differences between the classes in aspiration change after the receipt of information based on the referent "self." This finding was interpreted as suggesting the presence of latent or rudimentary ego mechanisms in the "character disorder" delinquent which enables him to modify unrealistic aspirations under conditions where ego-involvement is present. That they do not employ these mechanisms routinely is suggested by the finding that the "character disorder" delinquent modifies his aspirations significantly less than the "neurotic" delinquent and the non-delinquent when the referent "others" underlies the informational cue. According to psychoanalytic theory of delinquency, the referent "others" is not ego-involving for the "character disorder" delinquent. The data indicated no significant difference between the "neurotic" delinquents and non-delinquents in amount of change in aspiration under this experimental condition. This latter finding suggests that the omnipotent-like behavior of the "neurotic" delinquent is defensive, and is not a continuation of relatively unmodified infantile omnipotence concepts such as is found in "character disorder" delinquents.

In the present experiments, where the referent "self" is used, all groups shift their aspirations in a direction congruent to the information given, suggesting a response to the information. Where the referent " others" is used, the "neurotic" delinquent and non-delinquents maintain this tendency. Shift occurs in only 55 percent of the "character disorder" delinquent group, however. These findings were interpreted as suggesting that "self" is a more potent general reference for the "character disorder" delinquent than is "others." The finding also supports psychoanalytic formulations concerning the nature of the investment in others made by "character disorder" delinquents.

The results indicate that information mediated through an authority figure can be utilized by the "character disorder" delinquent when an ego-involving referent is employed. Further exploration of areas of ego-involvement for the "character disorder" delinquent is needed. The findings suggest that different types of delinquents should be dealt with according to their respective ego strengths and weaknesses if they are to benefit maximally from their opportunity for ego development in the milieu of institutional or other settings.

Microfilm $2.75; Xerox $7.80. 170 pages.

DELINQUENCY AND THE CONCEPT OF IDENTIFICATION

(Order No. 61-3239)

Donald George Lederman, Ph.D.
Washington State University, 1961

Chairman: Joseph F. Rychlak

Clinicians have reported their observation that many juvenile delinquents and adult criminals seem to have gaps or distortions in their consciences, engendered by disturbances of the identification process. While some progress has been made in operationally defining the concept of identification, and various techniques have found use in experiments concerning the identification process, the literature makes note of very few controlled experiments designed to validate the relationship between that process and delinquency. The present research was designed to subject this important aspect of the theorizing in the field of delinquency to controlled, experimental verification.

In so doing, it was deemed theoretically sound and experimentally useful to divide the hypotheses into three major areas. That is, the writer felt that disturbances in the identification process contribute to delinquency in three related, but distinguishable ways. The first concerns the lack of identification with parents and other authority figures. This lack is said to lead to a poorly-developed conscience, since the socially-directed values, attitudes, and controls which comprise the conscience and which are introjected as part of the identification process are thereby made unavailable to the child. This, in turn, allows instinctual and learned antisocial motives to find satisfaction without the punishment of guilt feelings.

The second area of inquiry was related to the concept of antisocial identifications. In this case, the child is said to have a well-developed conscience, but one which is comprised of antisocial values and attitudes, and is achieved through identification with parents who are themselves delinquent, with delinquent peers, and with the amorphous criminal role as this is defined by the culture. For such a child, the conscience not only allows satisfaction of antisocial motives, but may actually encourage behavior designed to achieve that end.

The third division concerned the child who suffers from a basic inability to identify with anyone. This type of delinquent is emotionally isolated from the rest of humanity; he feels a kinship to no one, either adult or peer. He perceives the entire world as an out-group, against whose members he may aggress without fear of internal sanction.

For this research, identification was defined as the subject's perception of similarity between himself and the models for that identification. The instrument chosen to measure the degree of identification-so-defined was G. A. Kelly's Role Construct Repertory Test [The psychology of personal constructs (New York: Norton, 1955)]. This technique was ideally suited for the present purposes

since it yields measures of identification with individuals, classes of people, and even with hypothetical ideals or roles. Forty delinquent subjects were secured at the Juvenile Diagnostic Center in Columbus, Ohio, and an equal number of matched, control subjects were obtained in the public schools in and around Columbus.

Hypotheses concerning the relationships (as described above) between each of the three aspects of disturbed identifications and delinquency were generated. Additional hypotheses, relating several factors usually associated with delinquency (such as parental rejection and broken homes) to the concept of identification, were also formulated. All of the hypothesized differences between the delinquent and nondelinquent subjects received unequivocal support. The major conclusion was that the concept of identification provides the best over-all theoretical framework within which all the diverse phenomena associated with delinquency may be explained and integrated. The last chapter was devoted to a discussion of the theoretical and practical (treatment and prophylaxis) implications of the findings. Microfilm $2.75; Xerox $6.20. 128 pages.

PARENT TREATMENT AND OUTCOME OF CHILD'S THERAPY

(Order No. 61-3451)

Aurelia Leffler Levi, Ph.D.
Columbia University, 1961

There are divergent opinions as to the importance of parent treatment to the successful outcome of child therapy. This study hypothesized that the successful outcome of children's therapy is related to the concurrent treatment of their parents.

The study was based on a comparison of outcomes for children of treated and untreated parents. Successful outcome was judged on the basis of disappearance of the children's presenting symptoms, as reported by the parents. The sample consisted of 314 cases, selected according to specified criteria, from the closed-case file of a child guidance clinic in a small Southern city.

It was found that there is no relationship between parent treatment and outcome of the child's therapy. The group of children whose parents received treatment did not have significantly greater success in therapy than the children whose parents remained untreated. Untreated parents were grouped according to the reason why they did not receive treatment. The various subgroups did not differ significantly from each other with respect to outcome of their children's therapy.

The data imply that the most important factor in the outcome of a child's therapy may be the identity of his therapist. Children treated by one of the therapists in the sample had a much better chance of success than children treated by any of the other fourteen therapists.

Length of treatment, though less important than therapist's identity, was also found to be a factor in treatment. While the superior therapist achieved as much success with his briefly-treated cases as with cases that remained for a longer time, the other therapists achieved much better results with cases who remained for relatively long periods.

The length of a child's stay in therapy was not related to whether his parent received treatment or not. The children of untreated parents remained in therapy just as long as the children of treated parents.

The length of time that the parent remained in treatment depended primarily on the identity of the child's therapist. The superior therapist kept his cases in treatment much longer than did less successful therapists. The parents of children treated by the superior therapist stayed, like their children, longer in treatment than did the parents of children treated by less successful therapists. But when those children who were successfully treated by these therapists stayed longer in therapy, their parents remained longer in treatment too.

The study contradicts the assertions in the literature that a child cannot be helped unless his parent is also treated, or that the child's therapy is facilitated when the parent is treated. It cannot be assumed that children's improvement is dependent on their parents' involvement in therapy. Indeed, this study suggests that the reverse may be true: when a child begins to show improvement, the parent is willing to keep him in therapy longer, and to remain longer in treatment himself. The interpretation implies, not so much that the children of certain parents do better in therapy, as that the parents of certain children stay longer in therapy.

None of the following were found to have significant bearing on outcome of child's therapy: child's age, sex, or presenting symptoms; type or intensity of parent's treatment; or identity of parent's therapist.

The Southern sample used was found comparable, both in rate of improvement and in specified characteristics, to a Los Angeles sample and a New York City sample. These similarities provide a basis on which to generalize the findings of the study.

Microfilm $2.75; Xerox $4.20. 78 pages.

THE EFFECTS OF INSECURITY UPON AGGRESSIVE RESPONSIVENESS

(Order No. 61-3536)

Daniel Edward Magaziner, Ph.D.
University of Pennsylvania, 1961

Supervisor: Seymour Feshbach

This study investigated the effects of insecurity manipulation upon the arousal of hostile drive, and upon the directness of aggressive expression. It was predicted that under attack treatment, increased security would result in relatively lower hostile drive induction, but would also increase freedom to direct overt aggression at the source of hostility arousal. Conversely, under attack, decreased security was expected to yield relatively higher hostile drive induction, but at the same time favor the use of less direct modes of aggressive expression, that is, displacement.

These relationships were tested by experimentally inducing either increased or decreased feelings of security by giving a group of college students high or low scores on a "Personality Integration Inventory." Subsequently, a second experimenter attacked the students relevant to their performance on a creative, problem solving task, disparaging

both their competence in particular, and their personal worth in general in a sarcastic, condescending, arbitrary manner. Measures intended to assess the subjects' non-directed, displaced and directed aggressive responsiveness were then administered. A second group of subjects underwent identical treatment with the exception that they were not attacked by the second experimenter. This group allowed for the determination of effects due to the security manipulation.

The following results were obtained:

1. On the direct aggression measure both the secure and insecure groups showed a significant increment in aggressive expression as a function of the attack variable. However, there was no significant effect attributable to the security variable.

2. On the displaced aggression measure insecure subjects who had been attacked showed a significantly greater degree of displacement than all other groups.

3. On the direct aggression measure, insecure subjects who had been attacked showed a greater tendency to displace, or generalize, aggressive expression to the study than all other groups, this difference falling just short of significance.

4. A significant negative correlation was obtained within the attack-insecure group between the displaced and direct measures of aggressive expression.

These experimental results generally supported the prediction that insecure subjects would express more displaced aggression under attack, but failed to support the prediction that secure subjects under attack would express more direct aggression than insecure subjects. The third hypothesis concerning susceptibility to hostility arousal was considered untestable due to the insensitivity of the non-directed aggression measure in this situation.

Factors that may have had a bearing on the outcome of the results were discussed in detail. Certain comparisons were drawn between the present study and previous relevant research in the area of aggression. Finally, broader implications of this experiment for social prejudice, and for future research were mentioned.

Microfilm $2.75; Xerox $3.80. 67 pages.

COGNITIVE AND DRIVE PROPERTIES OF CENSURE IN SCHIZOPHRENIC LEARNING

(Order No. 61-3241)

A M Marchionne, Ph.D.
Washington State University, 1961

Chairman: Clare W. Thompson

The present study was designed to investigate how various drive levels, as defined by the conditions of reinforcement, differentially influence the performance of chronic male schizophrenics in a paired-associate learning task. Parameters of the reinforcement condition were experimentally manipulated in order to determine (1) the effect of censure as compared to reward when these two reinforcement conditions are presented in combination and separately, (2) the influence of the cognitive and drive properties of the reinforcement variable, and (3) the effect of expectation of censure on the schizophrenic learning performance.

The sample of 80 male hospitalized chronic schizophrenic veterans were selected and matched with regard to age, education, months of current hospitalization, and number of hospitalizations. The subjects were randomly placed in eight groups experimentally distinguishable by the method of learning: anticipation or non-anticipation and the reinforcement condition. Four reinforcement conditions were used: Group I-A and NA, 100 per cent reward; Group II-A and NA, 66 per cent reward, 33 per cent censure; Group III-A and NA, 33 per cent reward, 66 per cent censure; and Group IV-A and NA, 100 per cent censure.

The experimental operations were designed to test five predictive hypotheses regarding the degree and direction of the schizophrenic's learning performance. Hypothesis I predicted improved paired associate learning by the method of anticipation vs. non-anticipation. Hypothesis II predicted that confirmation of the expectancy of censure would result in greater performance improvement in Group II as compared to the other experimental groups. Hypothesis III predicted a retarded performance for Group III as opposed to Group IV due to task complexity under a high drive state. Hypothesis IV predicted better performance on the censured pairs than on the rewarded pairs when these were presented in combination. Hypothesis V predicted censure to be a more effective motivation than reward in a situation where only either reward or censure is present.

The conclusions based on test of these hypotheses indicated that:

1. The effects of cognitive properties of censure are obscured by the drive properties of censure when only total scores are considered. However, trial by trial performance on censured pairs is affected when the cognitive properties of censure are maximized (anticipation). These properties of censure both facilitate performance as in Group II-A or impair performance as in Group III-A. Impairment appears related to an approach to learning specific censured pairs when the cognitive cues are present.

2. The role of expectation of censure or the reduction in emotionality attending confirmation of this expectation does not account for the schizophrenic's apparent responsivity to censure. The schizophrenic's learning performance in the absence of censure (Group I) is not significantly different from Group II where minimal censure is used.

3. Learning performance on a complex task when drive level is high results in significantly impaired performance. High drive level alone does not interfere with performance efficiency as evidenced by the learning performance of Group IV. However, in Group III where drive is high and the task complex, the performance of this group is significantly lower than all others.

4. The results of difference scores of performance on censured pairs as compared to rewarded pairs indicate that the schizophrenic is motivated to avoid censure when the condition of reinforcement is predominantly one of censure as in Group III. In such a situation, learning performance on the rewarded pairs is significantly retarded in comparison to performance on censured pairs.

5. The results do not substantiate the assumption that censure is a more effective reinforcement for the schizophrenic than is reward.

Microfilm $2.75; Xerox $5.20. 105 pages.

THE RELATIONSHIP BETWEEN RESPONSE STYLE AND PERSONALITY VARIABLES: ACQUIESCENCE AND SOCIAL ORIENTATION.

(Order No. 61-3598)

Richard Keith McGee, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Samuel S. Komorita

In recent years psychologists have devoted much attention to noncontent determined variance in personality test scores. This component of variance has generally been termed a "response set" or a "response style." The most recent approach to this problem has been to investigate the utility of response set variance for making individual predictions in personality assessment. It has been suggested that response sets, particularly response acquiescence, or the agreeing response tendency, are actually based on determinants within the personality syndromes of the responder.

A review of previous studies in this specific area revealed two basic inadequacies in their designs: (a) the tendency to use only one measure of the response set, and (b) the failure to use methodologically independent criteria, particularly behavioral measures of personality traits.

The present investigation was designed to apply a more rigorous test of the hypothesis that individuals with high acquiescence tendencies are socially oriented individuals who will (a) shift their own position in response to social pressure, and (b) withhold negative attitudes in order to gain social acceptance, more than individuals with low acquiescence tendencies.

Seven different measures of response acquiescence and two behavioral tasks were administered to 104 undergraduate psychology students. The measures were selected because in previous studies all of them have been used to measure acquiescence; as a group they represent the major techniques suggested thus far for the measurement of this particular response set. Reliability estimates were computed for each of the measures. The hypothesis was examined by intercorrelating the seven acquiescence scales, the two behavioral tasks, and sex.

The results indicated that although each of the seven acquiescence measures was reliably measuring something, they were not measuring a common trait. Likewise, the two behavioral tasks were unrelated to one another, and to the various acquiescence measures.

It could not be demonstrated that response acquiescence was itself a stable behavioral tendency appearing across several situations, or that measures of acquiescence could be used to predict performance in an independent behavioral task. Therefore, since neither of these essential prerequisites of the general hypothesis could be demonstrated, it was concluded that the hypothesis is untenable.

An explanation of these findings was advanced by suggesting the existence of different dimensions of acquiescence: (a) a "social acquiescence" which is reserved to denote personality traits including conformity, suggestibility, persuasibility, and related concepts; and (b) a "response acquiescence" which is used to denote the operationally defined tendency to agree with psychometric test items, irrespective of their content. It was suggested that the general hypothesis developed because of the lack of operational definitions and the indiscriminant use of these (unrelated) concepts interchangeably.

Evidence was cited from very recent research to support a distinction between characteristics of test items which elicit "response acquiescence" and characteristics within individual personality syndromes which elicit behaviors included under the construct "social acquiescence."

Microfilm $2.75; Xerox $4.20. 76 pages.

EFFECTS OF FATHER ABSENCE AND MOTHER'S EVALUATION OF FATHER ON THE SOCIALIZATION OF ADOLESCENT BOYS

(Order No. 61-3456)

Barbara Ann Bowens Miller, Ph.D.
Columbia University, 1961

As the father is generally assumed to be the most important male ego ideal with whom a boy identifies, the present research tested the general hypothesis that father absence has negative effects on the social behavior and attitudes of early adolescent boys. It was also hypothesized that negative evaluation of the father by the mother has detrimental effects on the socialization variables studied. These variables were peer status among male classmates, preference for girls, masculinity of interests, dependency upon teachers and aggression toward peers.

Using early adolescents from a New York City junior high school, the research compared 52 boys who had no father or other male adult living in the household with 52 boys whose fathers lived at home. In the father-absent group, the fathers had been absent for at least two years. In the main, the Ss came from low socioeconomic families, and the ethnic origins of the sample were primarily Negro and Puerto Rican.

Five hundred boys in the school completed a background questionnaire from which all boys who met the father-absent qualifications were selected; random sampling then enabled selection of a father-present group, comparable on relevant background variables. Sociometric ratings were obtained in the Ss' classes, and boys in the study completed a masculinity-femininity interest inventory based on Terman and Miles' work, and the Anderson Intra-family Questionnaire. Ratings on aggression and dependency were obtained from a sample of teachers. The use of an adjective rating list secured the mothers' evaluations of the fathers.

Statistical analyses of the data revealed that in general, there were no significant differences between father-absent and father-present boys, nor was the mother's evaluation of the father related to any of the variables. The one exception was the finding that, as predicted, father-absent boys had lower peer status than father-present boys. Additional post hoc analyses of the data indicated that in the total sample, the mother's employment outside of the home and the boy's perceived closeness to the mother was related to the son's masculinity of interests. The boys' perceived closeness to the mother was also associated with a higher preference for girls, and in the father-present group, with lower peer status.

The research was limited by the small number of

mothers willing to participate in the research and by practical difficulties encountered in getting reliable and valid teachers' ratings.

It was concluded that the generally negative results were highly related to the age of the Ss in the present sample and to their socioeconomic background. Generalizing of theoretical assumptions about pre-latency children to the adolescent seems hazardous, for whatever effects father absence may have on young children, subsequent experiences in the child's life may mitigate these earlier difficulties. Caution ought to be applied also when generalizing across social class lines, for it would appear that father absence has a different meaning for the lower-class child than it does for the middle-class boy. Since the family structure in the lower class is typically of the extended type, it may be easier for the father-absent boy to establish close ties with father surrogates than it is for the middle-class, father-absent boy, typically from a conjugal type of family. The research does suggest, however, that if father absence does have any effects on the adolescent boy, such effects are likely to be limited to the area of peer relationships.

The additional analyses of the data suggest that a boy's relationship with his mother, regardless of the father's role, may be of critical significance, and that a mother as well as a father, can be an effective instrument for socialization of the adolescent boy.

Microfilm $2.75; Xerox $5.40. 107 pages.

DEFENSE PREFERENCE AND PERCEPTUAL DECISION MAKING

(Order No. 61-3373)

Fredric Bertram Nalven, Ph.D.
Boston University Graduate School, 1961

Major Professor: A. William Hire

The general problem investigated was the relationship between psychological defense and decision making. The perceptual decision making performances of repressors and intellectualizers were compared under two different conditions of stress. The specific decision making variables studied were (1) the number of alternative hypotheses formulated, and (2) the amount of cue search required for a final decision.

A sentence-completion test, which served as the measure of defense preference, was administered to 224 college students. On the basis of extreme scores on this test, 30 subjects were selected as the repressor group and 30 as the intellectualizer group. These 60 subjects were then administered the perceptual decision making test. This consisted of eight crudely drawn pictures presented, by means of a special device, in cumulative horizontal segments. The test yielded two measures:

(1) Alternative Hypotheses: a score determined by the number of different things which the subject reported that the picture 'could be,' and

(2) Cue Search: a measure based on the number of cumulative horizontal segments of the picture which the subject required to be exposed before he arrived at a final decision regarding the nature of the stimulus. Each subject was presented four pictures under the Low Stress condition and four under the High Stress condition. The stress conditions were defined by the examiner's instructions and criticisms.

The evidence supported the hypothesis that repressors formulate fewer alternative hypotheses and require less cue search to arrive at a final decision than do intellectualizers. In addition, repressors undertook less cue search per alternative hypothesis than did intellectualizers. That is, the ratio of the number of alternative hypotheses formulated to the amount of cue search required for a final decision was higher for repressors than intellectualizers. As the degree of stress associated with the decision making test was increased, both repressors and intellectualizers decreased the number of alternative hypotheses which they formulated. The increased stress led to a decrease in the amount of cue search required for a final decision in the case of repressors, whereas intellectualizers showed an increase on this measure as stress was increased. The ratio of the number of alternative hypotheses formulated to the amount of cue search required for a final decision was unaffected by increased stress in the case of repressors. Intellectualizers and combined defense groups, however, decreased in their ratios as stress increased.

The major conclusions drawn from these results were:

(1) Repressive defenses, which may be assumed to keep threatening material out of conscious awareness, may produce a generalized restriction of the field of consciousness. In decision making situations, this restriction of consciousness narrows the array of alternative hypotheses formulated and limits the amount of cue search required to check out each alternative hypothesis. These consequences, in turn, restrict the amount of cue search required for a decision.

(2) Intellectualized defenses, which may be assumed to shift attention away from the emotional significance of conflictual situations and onto affect-free, abstract ideation, may result in a generalized expansion of conscious ideation. In decision making situations, this expansion of consciousness widens the array of alternative hypotheses formulated and increases the amount of cue search required to check out each alternative hypothesis. As a result, the amount of cue search required for a final decision is increased.

(3) Psychological stress has two kinds of effects on complex mental performance. On the one hand, it produces cognitive rigidity and "blocking." On the other hand, it increases reliance on preferred defenses and exaggerates characteristic response tendencies.

Microfilm $2.75; Xerox $5.60. 111 pages.

VARIABILITY IN THE MEANING OF DEVIANT BEHAVIOR

(Order No. 61-3602)

Fred John Pesetsky, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Herbert C. Quay

Man can be conceived of as having a "program" for living much the same as an electronic computer. Whether considered as a typical behavior pattern, "Style of Life," or "Adaptation Level," the "program" for man is both determined by and a determinant of how he perceives his past, present, and future behavior. It comprises an internal representation, a model of the universe, a map, or a schema by which the organism preserves his integrity and consistency in a fluctuating environment. This patterning is reflected in the meaning of his responses for the initiation and promulgation of his program. The major hypothesis of this study was that the more "central" the meaning of stimuli are for the expression of individuality or style of life, the more the responses to these stimuli are a function of the program and the more resistive they are to change.

The experimental group consisted of 75 institutionalized adolescent delinquents whose recidivist behavior was considered as reflecting a "deviant program" The fact that these youngsters have continued their deviant adjustment in spite of remedial procedures emphasizes the domination of their behavior by the "deviant program." A control group was comprised of 75 nondelinquent high school students whose behavior was free of any history of antisocial behavior. The groups were equated on the basis of age, education, socio-economic status, and rural-urban environment. Both a pilot study, and the present study yielded no significant correlations between intelligence and the dependent variable of variability in meaning so that control of this variable was unnecessary.

Both groups were administered the Otis S-A Test of Mental Ability, the Children's Locus of Control Scale, and the Action Rating Scale (ARS). The ARS was developed specifically for this study to secure measures of variability in the meaning of deviant behaviors through the use of Osgood's Semantic Differential. The concepts consisted of three deviant behaviors (stealing money, stealing a car, fighting) which were high in frequency among delinquents. A control concept of "laughing" was added to provide information about a concept not related to delinquency or the "deviant program." Each concept was embedded in ten different contexts supplying background information concerning the nature of the deviant behavior with the aim of changing the meaning of the concepts through the added information.

Information Theory Method was applied to the scores on the Action Rating Scale to derive "Uncertainty" (variability) measures which were subjected to analysis of variance. The hypothesis that the delinquent group would be less sensitive to the information provided by the changing contexts and thus less variable in their responses was substantiated beyond the .005 level. A significant F within subjects (beyond .001) was obtained for the concepts used in this study along with a significant (beyond.001) interaction between concepts and program (Delinquency vs. Non-delinquency). The lack of variability in meaning shown by the delinquent group was found to be specific to the delinquent concepts and was not obtained for the control concept indicating that the results were not a function of a set or generalized rigidity. Further analysis indicated that this lack of variability could not be attributed to social stereotypes or social desirability set.

The variability measures were found to lack significant correlations with other measures used in this study, establishing a lack of variability of meaning as a variable significantly related to a delinquent style of life. The significant correlations between the other variables were presented along with an analysis of the correlation clusters.

Microfilm $2.75; Xerox $5.20. 103 pages.

THE RELATION BETWEEN SELECTED PERSONALITY CHARACTERISTICS OF SOCIAL WORK STUDENTS AND ACCURACY IN PREDICTING THE BEHAVIOR OF CLIENTS

(Order No. 61-3900)

Harold Leslie Plotnick, D.S.W.
Columbia University, 1961

A theoretical approach which conceives predictive behavior to be a function of one's perceptions of others is presented as a means of unifying certain empirical data ordinarily subsumed under the concepts of social perception, empathy, or understanding. The viewpoint taken is that all these forms of behavior rest operationally upon the predictive behavior of the individual. The operational relevance of predictive behavior is apparent in social work in that at all levels, social work involves predictions on the part of a worker. Diagnosis represents a series of predictions resulting from the conceptualizations and hypotheses of the worker concerning the client. Planning is, in fact, prediction; and treatment involves prediction to the extent that it is anticipated that a certain approach or a group of techniques or procedures will be helpful to the client. Therefore, predictive accuracy may be viewed as one criterion of effective clinical performance. In this connection, it should be pointed out that predictive accuracy as a criterion of clinical ability is not meant to imply overall competence in social work performance. The ability to predict accurately does not assure the ability to use one's perceptions of the client appropriately or in his best interests; nor does it guarantee effective use of self in the worker-client relationship. However, it is assumed that effective help is based upon the worker's accurate appraisal of a client and his situation.

Prediction accuracy is assumed to be dependent upon the complexity of the individual's cognitive system, his intraceptive orientation and his intelligence. Three major hypotheses were derived:

1. Cognitively complex Ss will be significantly more accurate in predicting clients' responses than Ss who are cognitively simple.

2. Ss with high intelligence will be significantly more accurate in predicting clients' responses than Ss with lower intelligence.

3. Ss with high intraception will be significantly more accurate in predicting clients' responses than Ss with low intraception.

These hypotheses were tested on a sample of 129 first year social work students, each of whom predicted the responses of two clients on a scale measuring attitudes toward authority relationships. The first two hypotheses received some support from the results. The third hypothesis was not supported by the findings and, in fact, there appeared a trend for intraception to be negatively related to accuracy among the Ss in this study. Some implications of these findings are discussed with particular relevance to the problem of selection of students for the social work profession.

Microfilm $2.75; Xerox $8.60. 189 pages.

THE RELATIONSHIP BETWEEN SELF CONCEPT AND SUPERVISORY AND PEER RATINGS OF SUCCESS IN NURSES' TRAINING

(Order No. Mic 61-1580)

Harold Vincent Poland, Ph.D.
Fordham University, 1961

Mentor: Anne Anastasi, Ph.D.

The present study was undertaken to determine the relationship between various self concept measures and success in nurses' training as indicated by the two criterion measures of supervisory ratings and peer nominations. A secondary objective was to re-investigate the validity of intelligence test scores in terms of the criteria used in this study.

The subjects were 100, white, native-born, female, senior nursing students from an accredited nursing school of a large metropolitan general hospital. All were above average in intelligence and free from gross physical and emotional defects.

Two criterion measures, a supervisory rating scale and a peer nomination device, were constructed. One criterion measure consisted of the mean rating given to each student by 10 nursing supervisors on 10 traits. The other was the total nomber of nominations received by each student on the Peer Nominations Form. On this form, each student was asked to nominate any three of her classmates on each of the 12 sociometric statements.

Two predictor instruments were used, the Self-Descriptive Inventory, a device specially constructed for investigating self conceptualization, and the School and College Ability Tests, a standardized academic aptitude test yielding a verbal, a quantitative, and a total score. The subjects rated themselves on the Self-Descriptive Inventory under four different frames of reference, namely, the Self, the Ideal-self, the Average-nurse, and the Ideal-nurse. Those four self concepts yielded six D measures indicating differences between every pair of self concepts. A total inventory score based on the Self frame of reference was used as a tenth predictor variable.

The Supervisory Rating Scale and the Peer Nomination Form had reliability coefficients of .91 and .81, respectively. The predictor measures were also found to be highly reliable, as evidenced by reliability coefficients of .84 for the Self-Descriptive Inventory and .92, .93, and .95 for the SCAT-Verbal, SCAT-Quantitative, and SCAT-Total, respectively.

When the group was analyzed as a whole, no significant relationship was found between the 10 predictor variables and the criterion of Supervisory Ratings, but there were significant correlations between the Peer Nominations criterion and the SCAT-Verbal ($P < .01$), the SCAT-Quantitative ($P < .05$), the SCAT-Total ($P < .01$), and the Ideal-self vs. Average-nurse D measure ($P < .05$).

No significant differences between extreme criterion groups were found in any of the 10 predictors when Supervisory Ratings were used as a criterion. However, there were significant differences ($P < .05$) between the extreme criterion groups selected in terms of Peer Nominations on the SCAT-Quantitative, SCAT-Total, Self vs. Ideal-nurse D measure, Ideal-self vs. Average-nurse D measure and Total Self-Descriptive Inventory score. The more successful student, as determined by the Peer Nominations, tended to score higher on the SCAT than the less successful.

The more successful student also tended to show a smaller discrepancy between self and Ideal-nurse concepts and a larger discrepancy between Ideal-self and Average-nurse concepts. It is suggested that the former might indicate that the successful student nurse identifies more closely than the unsuccessful with her occupational role. The latter finding might result from the higher professional goals of the more successful student. Finally, the more successful students obtained higher total scores on the Self-Descriptive Inventory. Among the possible explanations of this finding might be mentioned the superior personality adjustment or a higher self esteem of the more successful student.

Since the predictors were being evaluated with the intention of improving the existing selection procedures it was desirable to test their effectiveness over and above such procedures. Therefore, a preselected population was employed. The reduction in heterogeneity that this condition produced accounts in part for the low relationships found. In subsequent investigations it would be more desirable to administer the predictors immediately after admission to the program in order to eliminate the influence of dropouts and nursing experience.

Microfilm $2.75; Xerox $6.20. 126 pages.

ELECTRODERMAL INDICATIONS OF LEVELS OF PSYCHOLOGICAL DISTURBANCE IN CHRONIC SCHIZOPHRENIA

(Order No. 61-4231)

Thomas Shelby Ray, Ph.D.
The University of Oklahoma, 1961

Major Professor: Oscar A. Parsons

While there is agreement in the literature that patients with chronic schizophrenia are characterized by disturbances in overt behavior, there is disagreement concerning the psychological processes which are involved. Various authors have stressed different levels of disturbance such as general withdrawal, apathy, inattention, failure to

establish and maintain sets to respond, and reduced affective reactions to various psychological and physical pain stimuli. The well documented relationship of these psychological processes and states with autonomic (galvanic skin responses) indices affords the opportunity to study the above mentioned problems without depending upon the presence or quality of overt behavior. Accordingly, specific hypotheses were derived and tested concerning levels of autonomic activation and specific reactions during various stimulus conditions.

The subjects were 34 randomly selected chronic schizophrenic women hospitalized 7 or more years and 20 psychiatric aides of similar age and socio-economic status. The schizophrenic subjects were removed from all somatic therapies for more than a year prior to the study.

The apparatus for measuring galvanic skin response was a calibrated electrical circuit with a Wheatstone bridge arrangement and a D. C. amplifier. Conductance levels and changes were recorded on an Esterline-Angus graphic recorder. Special finger electrodes minimized electrical artifacts and variations in area of contact.

Continuous galvanic skin response records were obtained during the following sequence of experimental conditions: an initial period of relaxation, instructions to think about but not respond verbally to emotionally "loaded" and "neutral" words (set-to-perceive), instructions to respond verbally to "loaded" and "neutral" words (set-to-respond), intermediate relaxation, and a series of threat-pain stimuli (verbal threat, prepare finger, sham-pain, and pain by taking a blood sample from a finger), and final relaxation.

The results indicate that chronic schizophrenic subjects, contrary to some previous experimental reports, are not characterized by differences in level of autonomic activation or by a lack of autonomic reactivity to threat-pain stimuli. Further, the ability to establish sets to perceive is apparently intact, but deficits occur in establishing sets to respond and in energy expended in specific responses. Chronic schizophrenic subjects are able to react differentially to verbal stimuli with affective connotations, but in the absence of task involvement differential affective reactions are diminished or absent.

These findings lead to a more optimistic view of chronic schizophrenia than is found in much of the literature. These patients are much more accessible and affectively reactive to environmental stimuli than their disturbed overt behavior would lead one to believe. The main levels of disturbance appear to be in establishing sets to respond and in executing overt responses.

Microfilm $2.75; Xerox $7.00. 146 pages.

SIZE CONSTANCY IN SCHIZOPHRENICS AND NORMALS

(Order No. Mic 61-1067

Marvin Norman Reisman, Ph.D.
The University of Buffalo, 1961

The purpose of this study was to investigate size constancy in schizophrenics and normals.

Previous research has demonstrated the plausibility of the view that personality variables are related to perceived content and size. The major theoretical position, derived from Fenichel (12) and Bruner (4), asserted that schizophrenics have a loss in object relations and attend less than do normals to the environment. Therefore, it was assumed that schizophrenics would rely less on spatial relations cues which usually enhance size constancy. This was presumed to lead to less accurate size percepts in schizophrenics.

The attempt was also made to reconcile discrepant findings among past studies on schizophrenic size constancy. It was assumed that a systematic investigation of the effects of three variables might resolve some of the differences in past findings. The variables were: (1) prognosis for improvement, (2) relative distances of the standard and comparison stimuli from the subject, and (3) the distance between the stimuli. It was predicted that schizophrenic patients with a poorer prognosis would be less accurate than those with a good prognosis. In turn, the latter were presumed less accurate than normals. Furthermore, it was predicted that the direction of errors would tend toward underconstancy when the comparison stimulus was closer than the standard to the subject, and the converse. Underconstancy means that the subject judged the stimulus to be smaller than its actual size. A greater distance between the stimuli was presumed to result in larger group differences in the measure of size constancy.

To test these hypotheses, three groups of sixteen subjects each were investigated for size constancy. Schizophrenic patients were assigned to a good or poor prognosis group on the basis of the Feldman prognostic scale for shock therapy. Both schizophrenic groups were compared in size constancy measures with normals. Subjects served as their own controls. Therefore, measures for each subject were obtained when the standard and comparison stimuli were alternately closer and when a small and large distance between the stimuli alternately existed for both stimulus positions.

The major findings were:

1. Schizophrenics were not less accurate in size constancy than normals.
2. Good prognosis schizophrenics were not found to be more accurate than poor prognosis schizophrenics.
3. The relative distances of the two stimuli from the subject (stimulus positions) determined the predicted direction of size estimation errors only for normals.

These findings were interpreted as contrary to the theory that schizophrenics ignore spatial relations cues. However, the theory was useful for predicting the size constancy of normals.

4. Differences between schizophrenics and normals were indicated but they appeared to be more complex than had been assumed. As the distance between stimuli increased, there was a tendency for the size constancy measures of normals to become larger as those of schizophrenics became smaller, and vice versa. Also, there were indications that the size constancy measures of normals were more stable than those of schizophrenics. Neither of these results, however, was conclusive.
5. The distance between the stimuli affected measures of size constancy. An interaction effect between distance and stimulus position was noted. Consequently, evidence was found that the differences between the results of past studies of schizophrenic size constancy may have been partly due to the differences in controlling distance and position.

Areas for further research were suggested for clarifying differences between the results of the present and past studies. Suggestions were also made for improving upon past and present methodological aspects.

Microfilm $2.75; Xerox $4.80. 93 pages.

PSYCHOLOGY, EXPERIMENTAL

MEASURING MINISTERS' ATTITUDES TOWARD JUVENILE DELINQUENCY

(Order No. 61-3364)

William Edward Alberts, Ph.D.
Boston University Graduate School, 1961

Major Professor: Dr. Paul E. Johnson

This is a psychological study of Protestant ministers' attitudes toward juvenile delinquency, and of their theological beliefs. The study has been guided by two hypotheses. The first hypothesis proposed that an interrelationship existed between a minister's attitudes regarding the causes and treatment of the different delinquencies and the degree of authoritarian or supportive tendencies in his personality. The second hypothesis assumed that an interrelationship existed between what a minister did in regard to juvenile offenders and his underlying attitudes toward causation and treatment. The survey of the ministers' theological beliefs focused on the possibility of an interrelationship between their beliefs and their attitudes toward delinquent behavior.

Two methods were employed to collect data and test the hypotheses: a Juvenile Delinquency Attitude (JDA) scale was constructed and administered to ninety-two ministers; then forty of the seventy-four respondents completing the scale were interviewed. The questionnaire also contained the Fascism (F) scale, which measures implicit antidemocratic tendencies in the personality, and the Traditional Family Ideology (TFI) scale, which measures attitudes toward family structure and functioning on a democratic-autocratic continuum. Following are the findings.

(1) The contrasting responses of the high (authoritarian) and low (supportive) scorers to the items of the JDA scale demonstrated the discriminatory power of the items and the interrelatedness of the authoritarian variables of the scale.

(2) The test of reliability indicated a correlation of .95 of the JDA scale test-retest and of .92 from the test score correlations. These correlations show a high degree of consistency between the ministers' responses in the first and second administrations of the scale.

(3) The correlation between the JDA and F scales was .831, between the JDA and TFI scales .817, and the correlation between the F and TFI scales was .774. These high correlations supported the hypothesis that a minister's internal frame of reference, i.e., his deep-rooted emotional dispositions, determined to a great extent, the nature of his attitudes toward the causes and treatment of juvenile delinquency.

(4) The data obtained in the interviews with the high and low scorers supplemented their respective scores on the JDA scale. High scorers viewed causation on a symptomatic level, communicated an authoritarian philosophy of treatment, expressed messianic concepts regarding the role of the church in treatment, and indicated limited awareness and utilization of community resources. Conversely, low scorers revealed a comprehensive understanding of delinquent motivation, a supportive philosophy of treatment, an interpersonal view of the church as a rehabilitative resource, and a high awareness and utilization of community resources. In addition the high scorers tended to be authoritarian and low scorers supportive in their handling of youth offenders. This finding substantiated the hypothesis that a minister's treatment of youth offenders was related to his attitudes toward juvenile delinquency.

(5) The measurement of the respondents' theological beliefs showed no significant correlation between their beliefs and their attitudes toward juvenile delinquency. The data revealed that both high and low scorers identified with similar theological positions. This finding indicated that religious beliefs can be reinterpreted to accommodate authoritarian or supportive tendencies. The finding was supported by the significant scores of the high scorers on the messianic sentimentality variable of the JDA scale. While they agreed with the apparently supportive items of the scale, their agreement with a large majority of contradictory authoritarian items suggested that they may have intellectually accepted the conventional view of supportive pastoral care and still rationalized conflicting attitudes and dispositions toward juvenile offenders and offenses. On the basis of these data, therefore, it was concluded that a minister's deep-lying emotional dispositions, more than his abstract theological beliefs, generally determine the nature, extent, and effectiveness of his approach to juvenile delinquency.

Microfilm $3.65; Xerox $12.85. 284 pages.

A GENETIC ANALYSIS OF GEOTAXIS IN DROSOPHILA MELANOGASTER

(Order No. 61-3428)

Loise Fay Erlenmeyer-Kimling, Ph.D.
Columbia University, 1961

Three principal steps in the analysis of the genetics of behavior are: the measurement of variability in a specified behavior trait within the population under study; the determination of the extent to which such variability is genetically controlled; and the analysis and specification of the genetic mechanisms underlying individual differences in the behavior.

Experiments in behavior genetics have generally dealt with the demonstration and measurement of the heritability of specified behavior traits in given populations. Those investigations which have attempted more extensive analysis have usually taken the form of hybridization studies, in which inferences regarding genetic mechanisms are based on behavioral comparisons among the hybrid generations.

The present experiment was designed to analyze the genetic correlates of individual differences in geotaxis in

Drosophila melanogaster. The study examined chromosomal changes occurring in response to selection for negative and for positive geotaxis and estimated quantitative contributions of each chromosome to geotactic performance in two selected strains and an unselected population.

Geotaxis, directed movement in response to gravity, was measured in a 15-trial multiple unit classification maze, which permits objective, reliable individual measurements simultaneously with the measurement of large populations. The alternatives of making a positive or a negative response to gravity are presented on each trial. Scores range from +7.5, the extreme of positive geotaxis, through 0, a neutral response to gravity, to -7.5, the extreme of negative geotaxis.

Starting with a foundation population which had an approximately neutral average score, selection pressure based on geotactic performance in the maze was applied in opposite directions to establish the Negative and Positive Geo lines. The present experiment began with Generation 21 of selection and continued through Generation 54. The Negative Geo line showed a slower and eventually greater response to selection than did the Positive line. With continued selection, both strains showed a decrease in variance. Within each strain, females obtained more extreme geotactic scores than did the males.

An unselected free-mating population descended from the foundation population showed no changes or trends in performance during the two-year period from the beginning of selection to the end of this experiment.

A chromosome assay technique was used for the genetic analysis. Flies of the three populations were crossed with a stock carrying standard chromosomes with inversions and marker genes. Backcrossing part of the F_1 to the population being assayed produced eight morphologically distinguishable classes, in various combinations of heterozygosity and structural homozygosity for each of the three major chromosomes. The effect of each chromosome was estimated by comparing the average geotactic score of the homozygotes for that chromosome with the heterozygote averages in a 2^3 factorial analysis. Between Generations 28 and 50 of selection, ten replications of the assay were performed on each of the three populations; in the majority of the replications, behavioral observations were made on two samples of approximately 200 flies each.

The chromosomal assays demonstrated the polygenic basis of individual differences in geotaxis in Drosophila melanogaster. Genes influencing the response to gravity are distributed over the three major chromosomes. Comparison of the selected line chromosomes with their homologues in the unselected population revealed changes correlated with the changes in behavior in each of the Negative Geo chromosomes and in the Positive Geo chromosome III. The effect of the X-chromosome on the behavior may be related to the sex difference noted in the selected strains. Epistatic interactions among the chromosomes are negligible, and nonadditive genetic variation is minimal, on the present scale of measurement. Approximately 41% of the difference between the selected lines in geotactic performance was accounted for by the different effects of their chromosomes.

Microfilm $3.25; Xerox $11.50. 251 pages.

THE ACQUISITION OF TWO DIFFERENT SHOCK-AVOIDANCE RESPONSES TO TWO DIFFERENT INITIALLY NEUTRAL STIMULI

(Order No. Mic 61-1057)

Walter Joseph Fiakus, Ph.D.
The University of Buffalo, 1961

One theory of avoidance regards the initially neutral stimulus as having acquired the capacity to elicit "fear" or "anxiety." According to Mowrer, for example, fear is a conditioned response, learned according to a stimulus substitution principle, with the initially neutral stimulus serving as the CS, and some primary noxious stimulus, such as shock, as the US. This hypothetical fear response is endowed with drive properties, but more important for the present purposes, the covert stimuli produced by the fear response tend to be regarded as the directing, or cue, stimuli for the observable avoidance response. This is clear from Mowrer's diagrammatic representation of his two-factor theory of avoidance learning, where "conditioning" and "problem solving" are laid "end-to-end." The initially neutral stimulus serves as a cue for the avoidance response only in the sense that it leads to another stimulus, fear, which is capable of evoking this response.

Such a conception, although perhaps tenable for the traditional single-response avoidance situation, seems to slight the possible cue properties of the initially neutral stimulus. If two such stimuli are separately paired with a common noxious stimulus, then presumably they would elicit the same fear response and the same response-produced stimuli. If it can be shown that the subject is capable of responding differently to the initially neutral stimuli then it seems obvious that they must have a cue function more direct than just eliciting a mediating fear. Miller has suggested that it may be possible for different patterns of fear to develop, but he did not explore this suggestion experimentally. The present dissertation represents a successful attempt to teach laboratory animals to respond appropriately to two different initially neutral stimuli which served as warning signals for a common aversive electric shock.

Male albino rats were used as subjects. A delay conditioning procedure was used for the development of both responses, with the sequence of light or tone warning signals determined by the Gellerman order. In Experiment I, 3 out of 9 rats learned to press a bar or pull a chain depending on whether the light or tone was being presented on any one trial. In Experiment II, such "double-avoidance" learning was contrasted with the traditional form of single-response avoidance training. It was found that the former problem is a much more difficult one for the rat than the latter.

In Experiment III, running and jumping were substituted as responses. The light and tone were retained as cues. Nine out of 12 rats that received some training on the component responses prior to actual double-avoidance training mastered this final problem. These rats met the criterion of 10 successive errorless "mixed" avoidance responses. Only 2 out of 9 rats that did not receive prior single-response pre-training mastered the final double-avoidance problem.

The main conclusions drawn from these three studies were that although it is difficult for rats to acquire

double-avoidance responses, part of the difficulties involved can be alleviated through 1), the appropriate selection of responses, and 2), some training on the component responses prior to actual double-avoidance training.

The phenomenon of double-avoidance learning was examined in the light of several contemporary theories of avoidance. It was suggested that although it is possible to handle the phenomenon within a framework which does not utilize an "anxiety" concept, this heuristically valuable concept can be retained through an elaboration of the "fear-mediation" type of paradigm suggested by such theorists as Miller, Mowrer, and Osgood.

Finally, the application of the double-avoidance training technique to the problem of "conflict" was commented upon. Some experimental evidence was presented to suggest that after rats have been trained in the double-avoidance manner, presenting the light and tone together does not lead to the appearance of any of the traditional behavioral indices of conflict. Microfilm $2.75; Xerox $5.60. 113 pages.

THE DISCRIMINATIVE AND SECONDARY REINFORCING FUNCTIONS OF A STIMULUS ASSOCIATED WITH SHOCK TERMINATION

(Order No. 61-3524)

George Fred Hunter, Ph.D.
University of Pennsylvania, 1961

Supervisor: William A. Shaw

This experiment deals with an attempt to establish a neutral stimulus which is associated with the termination of an aversive stimulus as a positive secondary reinforcer. Previous experiments dealing with this problem have yielded inconsistent results. These experiments attempted to establish a neutral stimulus as a secondary reinforcer by pairing it with shock termination. They did not take into account the discrimination hypothesis which concerns an important variable in the general area of secondary reinforcement. To clarify the inconsistencies, this experiment investigates whether or not a neutral stimulus associated with the termination of an aversive stimulus must serve as an S^d if it is to become a positive secondary reinforcer.

Method: Three matched groups of rats, nine per group, served as subjects. The groups were run simultaneously in a yoked cages design using three identical Skinner boxes that had grid floors and a bar pressing lever. Electric shock was used as the aversive stimulus and an ordinary house buzzer was used to generate the noise which served as the S^d.

Group I was exposed only to the noise. Group II had the noise associated with shock termination but there was no response that the animals could make that would terminate the shock. For Group III, the noise served as an S^d for the animals to make a bar press response that would terminate the shock for both Groups II and III and the noise for all three groups. During the training phase of the experiment, Group III had to learn that a bar press response would terminate the shock only after the noise came on. The shock would come on, and after a variable interval (10 to 30 seconds), the noise would come on and a bar press would terminate both. In this way, the animals in Groups II and III were forced to take a short interval of shock after which the noise came on and the animals in Group III could make a response that would terminate both noise and shock. Group II could do nothing to terminate the stimuli. Thus the noise served as an S^d for Group III and was associated with the termination of an aversive stimulus. As they learned the discrimination, their partner in Group II had the noise associated with the termination of shock.

Test: A trio was tested for the two consecutive days following the Group III animal's meeting the criterion for learning. Each animal was placed alone in a test apparatus for one hour on each of two days. The response to be learned was going back and forth from one end of a runway to the other. The act by an animal of going from one half of this runway to the other turned on the buzzer. If the noise had acquired positive secondary reinforcing properties, then Group III should make more crossings than the other two groups. That is, they should learn to perform a task for the presentation of the noise that had served as an S^d and had been associated with the termination of an aversive stimulus.

Results: T tests for differences between matched groups showed significant differences in the number of crossings made by the three groups. The difference between Groups III and I was significant beyond P=.001, between III and II beyond P=.02 and between II and I beyond P=.05.

Conclusions: It can be concluded that the experimental treatments used in this experiment produced a significant effect on the motivational properties of the noise. Two alternative accounts as to the nature of this effect are equally plausible: one in terms of secondary reinforcement, the other in terms of incentive motivation.

The results support only a weak form of the discrimination hypothesis: namely, that serving as an S^d enhances the acquired motivational properties of a stimulus but is not a necessary condition for its establishment as a secondary reinforcer or for increasing its incentive value.

Microfilm $2.75; Xerox $3.00. 35 pages.

DISCRIMINATION FOLLOWING VARIOUS CONDITIONS OF NONDIFFERENTIAL TRAINING

(Order No. 61-3409)

Charles Kiriazis, Ph.D.
Boston University Graduate School, 1961

Major Professor: Garry Margolius

The major purpose of the study was to investigate the relationship between preliminary training and subsequent discrimination behavior in an instrumental reward situation by: (a) utilizing different pretraining stimuli, (b) manipulating the amount of pretraining, and (c) employing a

factorial design to determine the interaction between these variables. The experimental design consisted of giving 3, 23, 63 and 103 nondifferentially reinforced trials: (a) to the stimulus which was used as the positive in a subsequent discrimination, (b) to the stimulus which was used as the negative in a subsequent discrimination, and (c) to two stimuli which were used as the positive and negative stimuli in a subsequent discrimination.

A successive discrimination problem involving the differentiation of responses to two circle-size stimuli was employed to assess the effects of the varying conditions and amounts of pre-discrimination training. Ten male albino rats were assigned to each of the 12 experimental conditions.

All pre-discrimination training treatments resulted in eventual discrimination learning as evidenced by a gradual decrease in latency of responses to the positive stimulus, and a corresponding increase in latency of responses to the negative stimulus. A number of different indices of discrimination behavior were used to ascertain the degree of differential responding displayed by the various groups during discrimination training. An analysis of discrimination criterion scores, correct response learning curves, number of total errors, and the ratio of positive to negative response latencies indicated that both pretraining variables (pre-discrimination training stimulus(i) and amount of pre-discrimination training) resulted in marked differences in the learning of the subsequent discrimination.

The groups pretrained on the positive stimulus were clearly superior to the others in attaining the discrimination at all levels of pretraining. Increased numbers of pretraining trials for these animals facilitated the learning of the following discrimination problem. The facilitative transfer effects resulted in differences among the groups that were manifest in the initial discrimination trials.

Varying amounts of pre-discrimination training on both stimuli did not result in any consistent differences in differential responding among the groups in the early phases of discrimination training. As discrimination trials progressed, however, the groups with the larger amounts of pretraining acquired the discrimination faster than the groups with the lesser amounts of pretraining.

The results of the groups pretrained on the negative stimulus were in marked contrast to the other groups in the early phases of discrimination training. The transition from pretraining on the negative stimulus to discrimination training resulted in differential response levels that were considerably below those experienced after the other conditions of stimulus pretraining. Although the decrement in performance was initially larger for the groups receiving larger amounts of pretraining, further discrimination training resulted in comparable rates of learning for all groups. Thus, the effect of increased pretraining on the negative stimulus was primarily transitory, and did not significantly facilitate or retard the learning of the subsequent discrimination.

Discrimination behavior following pretraining on both stimuli resulted in performance levels that were essentially similar to the results of pretraining on the negative stimulus.

The results were discussed with reference to various quantitative and perceptual interpretations that had been advanced to account for facilitative and retardative effects in previous experimental findings. It was concluded that none of the theoretical formulations provided an entirely adequate interpretation of the present findings.

Microfilm $2.75; Xerox $5.20. 101 pages.

THE OPERANT CONDITIONING OF A SOCIAL RESPONSE

(Order No. 61-3397)

Gilbert Levin, Ph.D.
Boston University Graduate School, 1961

Major Professor: Chester C. Bennett

A social response was defined as a discriminated operant which includes the behavior of more than one organism in a group and is at least partly under the control of stimuli produced by the group itself.

The purpose of the study was to examine the relationship between reinforcement and the rate of one kind of social response, namely the serial order of the speakers in a conversation. It was assumed that the laws of learning discovered in the study of the behavior of individual organisms would be sufficient to account for this aspect of group behavior, requiring no further theoretical assumptions. When the response was followed by a reinforcing stimulus it was expected to occur more often. When, subsequently, the response was permitted to occur in the absence of reinforcement its rate was expected to decline.

Method. Subjects were asked to come to a series of unanimous decisions about which of several stimuli to try to communicate telepathically to a receiver in another room. After each consensus they were to stop talking immediately, concentrate on that stimulus, and wait silently to be informed whether or not their message was received. After a three-second delay they were signalled whether or not their message had been received correctly and went on to try again.

Each consensus constituted a trial, of which there were 700 in all during seven days. A record was kept of the identity and order of the last two subjects to speak in each trial. In a three-person group there are six possible two-person trial endings. One of these endings (AB) was the social response studied.

On the first two days the "correct" signal (positive reinforcing stimulus) was sounded after one quarter of the trials on a random schedule, in order to establish a baseline rate for AB.

Days three to five were the conditioning period, during which AB was reinforced whenever it occurred.

During the final two days, AB was extinguished by withdrawing reinforcement from it.

Results. The experiment was carried out on three groups. In one group there was a significant increase in AB during the conditioning period and a significant decrease during extinction. Another group showed a significant conditioning effect and a non-significant extinction trend. Systematic changes did not occur in the third group. Hence, the extinction period was omitted and the conditioning period was extended for four additional days.

In all three groups there were a number of trials during

which fewer than two subjects spoke. When these trials are omitted from the analysis and AB is considered as a percentage of the trials where two or more persons spoke, the results conform more closely to the hypothesized distribution. Conditioning appears to have occurred in all groups and extinction in two of the groups. The baseline percentage of AB in the groups that showed both a conditioning and an extinction effect was 11% and 13%. During the final day of the conditioning period the rates were 33% and 64%, respectively. On the last day of the extinction period the respective rates were 18% and 24%. In the third group AB began at 17% and rose steadily to 29% on the fifth day, whereupon it declined to 15% on the ninth day, even though it continued to be reinforced.

An alternative explanation for the obtained behavior changes in terms of changes in individual response rates was evaluated and was not supported. The differential performance of the groups was discussed, as was the question of the subjects' awareness of the response-reinforcement contingency.

It was concluded that the social response studied had been brought under experimental control.

Microfilm $2.75; Xerox $3.80. 70 pages.

BISECTION OF A VISUAL SPATIAL INTERVAL

(Order No. 61-3895)

James Russell Nazzaro, Ph.D.
Columbia University, 1961

This study is concerned with the precision and accuracy of a subject's performance in bisecting a visual space bounded by two vertical fiducial lines. The influences of the following variables were examined: the luminance of the field, the separation of the fiducial lines and the area of the field.

The results show that:

1. Increasing the luminance of the field decreases the variability of the settings and also decreases the average absolute error of the settings.
2. Increasing the separation of the fiducial lines increases the variability of the settings and also decreases the accuracy of the bisections.
3. Effects due to luminance changes were analyzed in terms of intensity discrimination considerations and Hecht's curve of brightness discrimination was taken to provide a convenient empirical description, useful for indicating formal similarities among various types of data.
4. Variability of settings was found to be an approximately linear function of fiducial line separation.
5. Changing the area of the field seemed to have no effect on the precision of the bisections. Interpretation of the lack of area effect are given in terms of the concept of the "restraining" properties of borders.

Microfilm $2.75; Xerox $3.00. 38 pages.

PERFORMANCE IN SELECTIVE LEARNING AS A FUNCTION OF HUNGER

(Order No. 61-3608)

Charles Knight Ramond, II, Ph.D.
State University of Iowa, 1953

Co-Chairmen: Professor Kenneth W. Spence
Research Associate W. R. McAllistor

Forty-eight rats, divided equally into 22 hr. and 4 hr. hunger drive groups, learned to choose one bar rather than another during 40 free trials in a double Skinner box by being given twice as many reinforced trials to that bar on 80 interspersed forced trials to the individual bars.

The high drive group chose the more frequently reinforced bar significantly more often than did the low drive group. The high drive group also ran significantly faster to both bars on forced trials than did the low drive group.

The shape of the per cent choice curves was shown to be consistent with the notion that choice behavior may be meaningfully related to individual measures of the strengths of the incompatible responses between which choice is made.

The difference in choice behavior between the drive groups was interpreted as lending support to Hull's assumption that response strength is a multiplicative function of drive strength and habit strength.

Appended sections presented: (a) drive shift data which indicated that habit strength is not a function of time of deprivation, and (b) the derivation and analysis of a function which describes performance in the present selective learning situation.

Microfilm $2.75; Xerox $3.00. 53 pages.

PURE-TONE MASKING BY NARROW NOISE BANDS IN NORMAL AND IMPAIRED EARS

(Order No. 61-3970)

Paul Anthony Rittmanic, Ph.D.
The University of Oklahoma, 1961

Major Professor: John W. Keys

The phenomenon of auditory masking has been a subject of considerable interest to the field of acoustics for many years. The auditory system has been studied under controlled test conditions using different types of masking stimuli produced by pure tones, thermal noise, musical instruments, clicks, and other noises. The majority of the literature has reported studies of masking of pure tones by wide-band thermal noise in normal ears. The data reported from these various studies revealed close agreement regarding the response of the normal ear to wide-band thermal-noise masking.

The observations of various investigators on the effects of thermal-noise masking of impaired ears have not been in close agreement. Some writers stated that wide-band thermal-noise masking could be used in the differential diagnosis of hearing disorders while other investigators said this was not a reliable clinical test. Recent research definitely indicates that normal ears and impaired ears cannot be differentiated on the basis of wide-band masking

at equivalent effective levels. However, ears with sensori-neural damage did reveal excessive amounts of masking in the frequency ranges above and below the masking produced by narrow bands of noise.

The general purpose of the present study was to investigate the phenomenon of auditory masking of pure tones by narrow bands of noise in ears with sensori-neural loss due to cochlear pathology. Three basic questions were asked: (1) Would the normal ear and the ear with sensori-neural impairment due to cochlear pathology reveal essentially equal masked threshold sound pressure levels within the noise band?; (2) would the pathological ear be shifted to greater sound pressure levels than the normal ear in the frequency regions above and below the limits of the noise bands?; (3) would the degree and pattern of the spread of masking at frequencies above and below the noise be the same in the normal and pathological ear? Ten normal-hearing subjects, 10 normal-hearing subjects with the test ear plugged, and 20 subjects with sensori-neural impairment were used. Five narrow bands of thermal noise were employed to mask the pure-tone signals.

The results of the study revealed: (1) the normal ear and the pathological ear were shifted to approximately the same masked threshold sound pressure levels within the narrow-noise bands; (2) the sensori-neural ear revealed an 'excessive' spread of masking to frequencies both above and below the noise band; (3) all three groups showed similar spread of masking patterns in the frequency regions above the narrow-noise band centered at 4000 cps but not for the other noise bands.

Microfilm $2.75; Xerox $6.40. 134 pages.

THE USE OF STRATEGIES IN THE DECISION-BEHAVIOR OF CHILDREN, CHIMPANZEES AND MONKEYS.

(Order No. 61-3647)

Ronald Jay Schusterman, Ph.D.
The Florida State University, 1961

The purpose of this research was to determine the effect of differing sequences of reinforcing events on the decision-behavior of adult chimpanzees, juvenile rhesus monkeys, mentally retarded children (Mean CA = 10.1; Mean MA = 5.2) and normal children of different ages. Behavior was analyzed in terms of three types of responses, which were assumed to be contingent on the following events: (a) trial outcome--reward or nonreward, (b) previous response, (c) position preference.

All Ss were tested in a 50:50 probability learning situation. Testing was conducted with a modified WGTA, employing the spatial-discrimination-method. With the exception of the three year old children and the monkeys, Ss were tested with and without 100:0 initial training. For the 50:50 probability series, half the Ss in each such group received Short-Run (conditional probability = .39), and the other half Long-Run (conditional probability = .64) sequences. All groups were than shifted to a 100:0 final learning session.

The most significant general finding indicated that although ontogenetic, species, experiential and intellectual factors dictate different initial response tendencies in this situation, experimental manipulation can either strengthen or weaken, or even change the kind of strategy used. In addition, training phases induced response tendencies which were related to performance on final learning. More specifically, the following was found: (a) Whereas monkeys tend to prefer an initially positively strengthened position under a Short-Run series, they tend to follow a Win-stay, Lose-shift strategy under a Long-Run series; (b) three year old children (Mean CA = 3.5) show a strong Win-stay, Lose-shift strategy which decreases rapidly with age, reaching a fairly stable level at about age six in humans; (c) chimpanzees also show a strong Win-stay, Lose-shift strategy, but the Win-stay portion is considerably enhanced with initial 100:0 training; (d) five year old children (Mean CA = 5.1) and mental retardates show strong repspnse alternation without regard to outcome, which decreases with age; (e) initial training and series contingencies have strongest effects on behavior of older children; (f) discrimination between probability series and final learning phase in proportion to the strength of the Win-stay, Lose-shift strategy during the probability series indicates the following ranking from greatest to least: (1) ten year old children (Mean CA = 10.8), (2) five year old children, (3) mentally retarded children, (4) three year old children and adult chimpanzees (approximately tied). Extreme variability precluded ranking the monkeys. (g) Prediction of alternate outcomes, i.e., location of food reward, was greater after success than after failure for all types of Ss except the ten year old children.

Microfilm $2.75; Xerox $5.20. 105 pages.

LUMINANCE THRESHOLD AS A FUNCTION OF ANGULAR DISTANCE FROM AN INDUCING SOURCE

(Order No. 61-3912)

Gary Toshi Yonemura, Ph.D.
Columbia University, 1961

This experiment is concerned with the distance from the edge of a large luminous inducing source at which a lighted test spot seems to disappear from view. The small test spot is moved closer and closer to the inducing field until the spot disappears; inducing field and test spot luminances are parameters. The experimental data have a bearing on two aspects of spatial effects observed in human vision; retinal interaction processes and effects due to scattered light.

The results of the experiment indicate that the principal effects of the inducing source on the test spot are suppressive or inhibiting. (1) The threshold of the test spot decreases as distance from the inducing field increases. (2) The rate of change of threshold decrease diminishes as the separation between the inducing field and test spot increases. (3) The threshold of the test spot increases as luminance of the inducing field increases. (4) The rate of change of threshold increase diminishes as the luminance of the inducing field decreases. The test spot may, in turn, have inhibitory effects on the inducing field. These results are interpreted in terms of inhibitory interaction processes and their effects in the presence of stray light. Considerations relative to brightness discrimination are introduced and it is demonstrated that the results of the present experiment are describable as having some of the formal characteristics of that type of discrimination. Microfilm $2.75; Xerox $3.00. 48 pages.

THE LIFE AND WORKS OF RABBI JACOB REISCHER

(Order No. Mic 61-2109)

Rabbi Rudolph J. Adler, D.H.L.
Yeshiva University, 1960

Chairman: Dr. I. Lewin

Jacob Reischer, who was born in Prague about 1660 C.E., was a prominent Talmudist, Respondent, Rabbi, and author. His best known work is the Responsa collection, Shebut Ya'akob, from which Reischer received his fame in Rabbinic circles as well as his name--The Shebut Ya'akob.

Reischer married the daughter of Rabbi Wolf Spira of Prague and he had one son, Simon. It seems that Reischer received his training in Rabbinics from his father, Joseph, his relative, Simon Spira, and his father-in-law, Wolf Spira, Simon's son.

Jacob Reischer's Rabbinic career began in Prague where he became Head-judge of the local Jewish court. He then received a call from the Polish city of Reisha as well as the German community of Ansbach. It seems, however, that Reischer never left Prague for any length of time, until he settled in Worms in 1714 and Metz in 1717. He died in Metz in 1733 and was buried there.

Reischer began his literary activity with his Minhat Ya'akob, a lengthy commentary on Moses Isserles' Torat Hatat. Then came the Hok Ya'akob, a commentary on the laws of Passover of the Shulhan Aruk. In 1710 Reischer published the first volume of his opus magnum, the Shebut Ya'akob, followed by the second volume in 1719. Next Reischer printed his Iyyun Ya'akob, a commentary on the Aggadic collections of the Talmud by Ibn Habib. Finally, a third volume of his Responsa was published by his great-grandson posthumously in 1789.

Reischer's main field of endeavor was Halakah, where he insisted on basing his decisions on Talmudic sources rather than on superficial and abridged later commentaries. He also tried to be lenient in ritual law and was willing to shoulder the responsibilities of Rabbinic leadership in new and modern Halakic decisions. In his Aggadic commentary Reischer was clear, original, and quite rational.

Reischer insisted that the Rabbi was to be the only authority in all religious matters in the Jewish community. He was an exemplary spiritual leader, displaying a sincere concern for his people, sound judgment, and courageous leadership. Reischer was also a capable and devoted teacher serving as Headmaster of the Talmudic Academies of Worms and Metz. However, he did not openly participate in the important Jewish movements of his day, such as Shabbethai-Zebilism, Cabbalah emphasis and the beginnings of the Eybeschutz-Emden controversy.

Reischer's fame rests most profoundly on his literary output. Both the amount and the variety of his activity testify to the enormous effort he must have exerted in behalf of this work. It appears that Reischer's reward was also greatest on account of this special endeavor, for it provided him with the lasting fame of eminent scholarship in the field of Rabbinic studies.

Microfilm $2.75; Xerox $8.00. 171 pages.

THE CHURCH, THE BRIDE OF CHRIST.

(Order No. 61-3590)

Richard Alexander Batey, Ph.D.
Vanderbilt University, 1961

Supervisors: Professor Leander Keck and Professor Lou Silberman

The thesis investigates the implications of the nuptial imagery in Eph. 5:21-33 for the doctrine of the Church. The method for investigating the nuptial imagery in Ephesians begins with a critical history of the use and development of nuptial symbolism in Jewish, Hellenistic and Gnostic religions, before turning to a careful exegesis of the immediate text (Eph. 5:21-33). Then each of the three major concepts (Christ as Head, Bridegroom, and "One Flesh" with the Church) is explored.

The use of nuptial symbolism is a universal expression of man's religious experience. The Canaanites patterned their nuptial ritual upon the divine mythological order and endeavored by sympathetic magic to stimulate celestial unions which would produce fertility. The Hebrew prophets dared to adopt the vocabulary of their antagonist to express the personal and steadfast love of Yahweh, which was the foundation of the covenant. The prophets found in the metaphorical portrayal of Israel as the wife of Yahweh the most adequate expression of the personal bond sustained by Yahweh with the community. The first century Jews preserved the prophetic nuptial symbolism; to some, however, Torah became the Bride whom God had given to Israel. Other rabbis were influenced by apocalyptic thought and the wedding figure became a symbol of national independence and the ideal Messianic age.

The importance of the Hellenistic sacred marriage is best observed in the mystery religions where copulation with the cultic personnel provided the means for apotheosis. The sacred marriage as the sacrament of divine henosis was adopted by Gnosticism, but the problems created by the physical aspect of the rite resulted in an increasing emphasis upon its spiritual character.

That Christ made use of nuptial symbolism is well attested in the Gospels, where he implicitly identified himself as the Bridegroom to whom belongs the Messianic Bride—community. The final wedding ceremony is a theme

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

taken up in the Book of Revelation with typical apocalyptic pageantry. Paul's introducing Eve into this figure, as a type of the credulity from which he seeks to deliver the Corinthians, opens the door for the Ephesian author to combine the figure of the Church-Bride with Adamic speculation current in the first century. That the closest parallels to the nuptial imagery of Ephesians are to be found in Justin the Gnostic's Baruch is not surprising when one realizes that Justin himself borrowed freely from the Old Testament, the Gospels, and even Paul.

Ephesians 5:21-33 sets forth three concepts concerning Christ's relationship with the Church. The preparation of a bride for her husband is presupposed as an analogy for vividly setting forth the purposeful love which Christ has bestowed upon the Church. As the Bride of Christ, the Church has been graciously elected by the divine will; yet she remains free to accept or reject her calling. The acceptance of the betrothal gift as it is presented with the word (kerygma) binds the covenant agreement and betroths (sanctifies) the corporate Church unto her Lord. The Bride symbol is an excellent expression of "realized eschatology," for the Church has been sanctified unto the Lord, and yet lives in hope of the future parousia.

The author sees in the "one flesh" union, whereby husband and wife become united into one body or personality, a revelation of the nature of the unity sustained by Christ and his Body the Church. Just as the "one flesh" union restores the wholeness of God's original creation, the union established between Christ and the Church is the fulfillment of God's eternal purpose for creation—to unite all things in Christ. The personality of Christ is encountered in the Word of the gospel and devotion, and finds expression in a community where each interpersonal relationship is established upon the character of the love revealed in Christ. Since each personal bond reflects the personality of Christ, the Church is a corporate expression and historical continuation of his personality, and is the visible locus of Christ's personal presence in history at the level of human experience and activity.

The author of Ephesians maintains that the headship of Christ over the Church and a husband's headship over his wife is of a like nature. Just as the woman was originally taken from man, so the Church has derived her existence from Christ and is ontologically dependent upon him. The woman has been created from man, and only through the proper relationship of submission toward him can she realize the fulfillment of her existence. The Church likewise has been created for a divine purpose—a purpose to be realized only in dedication to Christ's will.

Microfilm $3.80; Xerox $13.50. 296 pages.

RUAḤ HAḲODESH IN SOME EARLY JEWISH LITERATURE

(Order No. 61-3591)

Edward Lee Beavin, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor Lou Hackett Silberman

The unexpected frequency with which the term ruaḥ haḳodesh (the holy spirit) is used in the newly discovered Qumran documents suggests the appropriateness of a renewed study of this concept in early Jewish literature. This paper is a detailed textual study of its meaning, and as such both its scope and procedure are strictly defined. Attention is limited to those passages in which the term ruaḥ haḳodesh occurs, and the context of each passage is carefully examined in an attempt to derive its meaning exegetically. Throughout, the basic assumption is that the meaning of the term is largely to be determined by the context of its usage. Primary sources are used wherever possible. Since ruaḥ haḳodesh occurs only three times in the Old Testament, these references are included in the section on the Apocrypha.

This study may contribute to general understanding of religious thought in the intertestamental period, provide a supplementary resource for those who may wish to make a more inclusive study of ruaḥ itself and related concepts, and assist present attempts to place the thought of the Qumran community within the total religious milieu of the time.

Results of this research indicate that although flexibility of usage was the rule, rather than the exception, the term ruaḥ haḳodesh was used in early Jewish literature within recognizable categories of meaning. At times the term only signifies God or the presence of God with no further nuance of meaning. As such it is a surrogate or metonym; a substitute for the Tetragrammaton. Elsewhere the term signifies God's presence with the individual or group as active in various functions. The ruaḥ haḳodesh supplies specific knowledge or information, unattainable by other means. Wisdom in a general sense comes through the presence of the ruaḥ haḳodesh. That spirit is the source of cleansing for man, acting on him as purifying agent. Strength for man, meaning moral and religious integrity or steadfastness, comes through the ruaḥ haḳodesh. It is the source of prophetic inspiration. Finally, it functions as the inspiration or author of Scripture.

There is no direct correspondence of usage between any two of the three collections, and no single collection uses the term in all of the above senses. Qumran thought seems to have occupied a "middle ground," touched on one side by the theology of Apocryphal works, and on the other by rabbinic developments. But consideration of the prominence with which each of these categories of meaning is employed shows that with reference to the concept of ruaḥ haḳodesh, at least, the thought of the Qumran community was closer to that of Apocryphal and Pseudepigraphical books than to that of Tannaitic literature. This conclusion is compatible with the results of other studies.

Microfilm $2.75; Xerox $5.60. 115 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

THE TEACHING OF RELIGION IN THE PUBLIC SCHOOLS OF THE PHILIPPINES

(Order No. 61-3634)

Esmeraldo A. de Leon, Ph.D.
The Florida State University, 1961

The purpose of the study was threefold: first, to develop historical perspective for the present-day issues about religious instruction in the public schools of the Philippines; second, to describe and analyze the nature of the present-day issues; third, to assess present policies in the light of prior administrative policies and practices.

American administration of the Philippines was altruistic. It brought a new doctrine in colonization. Its purpose was to educate and prepare the Filipino people for self-government. In keeping with this purpose a centralized, state-controlled, and secular system of education was established.

Consideration was given to teaching religion in the public schools. A provision in the Organic School Law was made which would permit it. The time and the place for such teaching was not specified. This was left to the discretion of the division superintendents. Upon written request by the parents of the children in the school these public school officials were to designate the time and the place. Aware of the implications and limitations of this particular legal provision in the light of the constitutional principle of separation of church and state, the division superintendents allowed religious teaching only before and after school hours. This practice became the standing policy of the Department of Public Instruction throughout the whole period of American administration. This policy was literally adopted and consistently followed by the ensuing Commonwealth Government and by the Republic of the Philippines during its early years.

Attempts were made to change the law on religious instruction in the public schools by constitutional provision. These attempts failed. The law formulated under the American administration was retained as part of the Constitution of the Philippines. This act by the Constitutional Convention was significant. It represented the adoption by the Philippines of the American principle of separation of church and state in its application to the administration of a public school system.

Another attempt was made to change the principle by statutory law. This was done by the passage of a bill which would have made religious instruction a part of the public school curriculum. This bill was vetoed by President Quezon in 1938 on grounds of unconstitutionality. The veto message gave the President the opportunity to state publicly that the principle of separation of church and state in the Philippines was not a mere theory but a reality. He stated further that as far as the people of the Philippines were concerned, the question was forever settled. He would not allow ecclesiastical interference in the affairs of the state.

Upon strong pressure from Catholic officialdom and several Catholic organizations, President Quirino in 1953 yielded and issued an Administrative Order that reversed the stand of all prior administrations, American and early Filipino. The order directed the modification of the standing policy of the Department of Education in order that religious instruction could be given in the public schools during school hours. In carrying out this order the Department of Education formulated a well-defined policy making religious instruction virtually a part of the public school curriculum. This administrative practice constituted a sharp break with prior administrative practices and a virtual amendment to the Constitution of the Republic of the Phillippines contradicting the basic principle of separation.

Microfilm $2.75; Xerox $8.60. 190 pages.

AN EVALUATION OF A GROUP DEVELOPMENT LABORATORY APPROACH TO TRAINING CHURCH LEADERS

(Order No. 61-3737)

Paul Merritt Dietterich, Th.D.
Boston University School of Theology, 1961

Major Professor: Dr. Walter L. Holcomb

The purpose of this project is to evaluate some of the effects of two one-week, experimental, pilot laboratories in group development, as sponsored by the General Board of Education of The Methodist Church, Division of the Local Church. The two laboratories, held in Oxford, Mississippi, in 1957, and in Omaha, Nebraska, in 1958, were similar to training experiences conducted by the National Training Laboratories and the National Council of Churches, although unique in length.

The chief concern of this project was to share with church leaders, ministers, directors of Christian education, conference and district Christian education workers, recent social science insights into the problems of planned change.

Evaluation research instruments, eight paper and pencil procedures, were used to gather data from seventy-nine participants at the two laboratories, testing them before, after, and at three- and six-month intervals following the laboratories. The measuring instruments, designed at the Boston University Human Relations Center, were aimed at measuring participant-change in terms of five sponsor-goals: self-insight, diagnostic sensitivity, concepts of leadership, redemptive fellowship, and functional application. The results of this study showed statistically significant change occurring in relation to all the goals.

Relative to self-insight, participants gained new ability in observation of self and others; gained new perceptions of self in terms of roles taken in groups; recognized personal needs for acceptance and belonging; gained new perceptions of other group members' feelings and needs; recognized that their own behavior in groups stimulated certain responses from other group members; achieved new awareness-level understandings of self as group members which became reinforced and clarified in the three months following the laboratories; tended to see themselves taking the "initiator" task role and the "standard-setter" maintenance role.

Relative to diagnostic sensitivity, participants gained a new diagnostic vocabulary which helped solve human relations problems back home; recognized that the basis for human relations situations lay within people and groups rather than from outside forces; became more sensitive to other members' feelings and needs; recognized their own involvement in human relations situations.

Relative to concepts of leadership, participants became more aware of how persons change and grow; became less militant about forcing social change; were reinforced in their belief in wide representation for planning change and in their conviction that lay people had the ability to take major responsibility for decision-making; became more aware that leadership is changing oneself in relation to other group members.

Relative to redemptive fellowship, participants became aware of previously unrecognized dynamics of group membership; defined the redemptive fellowship as including warm acceptance of others, sense of God's presence, feeling of belonging, self-insight, and face-to-face interaction which permits expression of both positive and negative feelings; recognized the lack of these components in most church groups; recognized the need of church groups to have these components.

Relative to functional application, participants applied laboratory learnings to their back-home working situations by building "feedback" into training programs, making changes in self as a means to bringing about change in others, applying new self-insights, new diagnostic sensitivity and vocabulary, and aiming toward a redemptive climate. Colleagues back home reported the participants to be more effective church leaders after laboratory training.

This project implies the need of church leaders for training in change-agent skills, understanding how groups develop, as well as in self-insight, diagnostic sensitivity, concepts of leadership, redemptive fellowship, and functional application. It also implies the need for further research projects within the church.

Microfilm $8.30; Xerox $29.50. 654 pages.

A SOCIOLOGICAL ANALYSIS OF CHURCH UNION IN CANADA

(Order No. 61-3385)

Edgar Francis File, Ph.D.
Boston University Graduate School, 1961

Major Professor: Dean Walter G. Muelder

This dissertation seeks to present a functional analysis of the church union movement as it has developed in the Canadian scene up to and including the formation of the United Church of Canada in 1925.

The research method has been to apply categories of analysing and interpreting relevant sociological data which have been developed by such theorists as Troeltsch, Yinger and H. Richard Niebuhr. Following this methodology it has been possible to identify and assess the complex converging and opposing social forces which influenced the genetic process of the 1925 church union. H. Richard Niebuhr's The Social Sources of Denominationalism and Robert Lee's The Social Sources of Church Unity have made particularly significant contributions for this study of the role which various sociological factors have played in influencing both the unity and continued disunity among the various Protestant denominations in Canada.

Particular stress is laid upon the fact of the functional inability of the separate denominations adequately to serve the religious needs of Protestantism in Canada. Specifically it is asserted that the opening of the west had forced a closer unity upon the Protestant denominations in Canada. The response which the various denominations made to this demand for closer unity was determined largely by an interaction of theological and sociological motives.

Certain sociological factors operated as barriers to interdenominational union. Sustained regionalism or sectionalism prevailed among Baptists and among Newfoundland Methodists as sources of disunity. Social status and class distinctions were maintained among the Anglicans and among some Presbyterians and served as barriers to union. The relatively lower social status of Baptists further influenced that denomination against union with other denominations of relatively higher social status. Another factor of ethnic and cultural differences was apparent as a source of disunity in the Presbyterian Church, in the Church of England and in the Lutheran Church. The factor of an established bureaucracy, particularly in the Church of England, served as an additional barrier to closer unity.

These above factors have played a significant role as sources of continued disunity. There were, however, certain denominations in which these social differences were being reduced, in which various social factors were functioning as sources of greater unity.

Regional or sectional differences had been largely overcome among the Methodist, Presbyterian and Congregational Churches. Each had a history of regional unions leading up to its existing national union, which also carried with it a momentum toward further union. Ethnic and cultural differences as well as differences in social status had also been diminishing steadily among Methodists, Congregationalists and most Presbyterians. The frontier also had little respect for class distinctions, drawing all available resources into its local community life and its local union churches. The stabilizing function of the Methodists during the whole period of negotiations was a very important factor facilitating union. Also the drive and zeal and significant role of the church leadership must be stressed.

Among other factors fostering closer unity there was the growing Canadian nationalism with the appeal of a great national Protestant church and the new institutional patterns with the drive toward greater efficiency and centralized control on a national level. This new national spirit related to the widening national frontier and to the minimizing of old religions, ethnic and cultural loyalties and differences became a powerful force influencing closer unity.

The main conclusion to be drawn from this study is that where the social and socio-cultural differences among Canadian denominations are minimized, as in the case of the Methodists, Congregationalists and most Presbyterians, this itself becomes a factor facilitating church union which when coupled with other sociological factors, become together important forces influencing church unity. Where these social and socio-cultural differences are sustained they remain sources of continued denominationalism and disunity as in the case of Baptists, Lutherans, Anglicans and non-concurring Presbyterians, in spite of the sociological forces demanding closer unity.

Microfilm $3.70; Xerox $12.85. 285 pages.

SYMBOLISM OF THE EUCHARIST: A PHENOMENOLOGICAL STUDY.

(Order No. 61-3406)

William Edward Finch, Ph.D.
Boston University Graduate School, 1961

Major Professor: Dr. Judson D. Howard

Carl Gustav Jung has devoted specific attention to religion and the Christian Eucharist. The individuation process is central to his system, and he identifies the Eucharist as a rite of individuation. The dissertation investigates the theories of analytical psychology pertaining to this sacrament. Comparisons are made between Christian and non-Christian sacramental rites as a means of clarification and illustration. An essay written by a counselee after termination of a therapeutic relationship with a pastor is presented to illustrate how individuation may function in the Eucharist and to give a basis for a critique of Jung's theories.

Jung holds that religion, as a deeply rooted phenomenon of human psychic life, is founded in the collective unconscious and is archetypal in nature; the archetypes are symbolized when they manifest themselves to consciousness. When the self archetype, which is very similar to the God archetype, becomes more highly differentiated and synthesizes other archetypes around itself, a person experiences individuation which is a natural process tending toward union of personality. The change from a segmented to a unified psyche is effected via the process of transformation. The Eucharist is seen as a general therapeutic system which leads toward individuation.

Material in which the theme of transportation is evident is presented in three groups to illustrate Jung's theories: (1) the historical origins of the Eucharist, (2) primitive rites which are transformation parallels of the Eucharist, and (3) an essay by a counselee: "A Transition Report; From Death to Life Through Holy Communion." Though the material presented generally illustrates Jung's theories, there is question as to whether he adequately accounts for the social, environmental, and interpersonal influences affecting individuals experiencing such transformations. The archetypal nature of religious experience is illustrated by the data, but there is evidence that the theoretical formulations of analytical psychology need to be expanded to account for the personal factors in greater measure.

Jung's boundary concept of the personal unconscious could be greatly expanded so as to permit a more comprehensive theory which would include the interpersonal aspects of religious experience. It is also probable that much of Freudian theory could be included in the concept of the personal unconscious.

There appears to be a therapeutic element or nature evident in the Eucharist. If Jung's claim holds true that the Eucharist is a rite of transformation, then the rite has an inherent therapeutic quality. This could prove to be useful knowledge for the pastor in the care and cure of souls. Microfilm $2.75; Xerox $9.25. 203 pages.

CRITIQUES OF CONCILIAR ECUMENISM BY CONSERVATIVE EVANGELICALS IN THE UNITED STATES

(Order No. 61-3738)

Harald Christian Andreas Frey, Th.D.
Boston University School of Theology, 1961

Major Professor: Dr. Nils L. Ehrenstrom

Statement of the Problem. The purpose of the dissertation is to present the sources and the contents of current conservative evangelical critiques of conciliar ecumenism in a systematic fashion, to analyse the accuracy and validity of the criticism in relation to representative ecumenical positions, and to show possible similarities, misunderstandings, and divergencies among the expressed points of view. "Conciliar ecumenism" refers to the World Council of Churches and the National Council of Churches of Christ in the U. S. A.

Content Structure. Chapter II presents a survey of conservative evangelical institutions and critics, their theological presuppositions and motivations. Chapters III-VI cite the critiques of ecumenism in relation to its Biblical and theological foundations, to the concept of the Church and Christian unity, and to the structure of ecumenical organization. Chapter VII deals with the moderating influences on the conservative critique, notably the effects of unity efforts within the ranks of conservative evangelicals, the apparent evangelical penetration of conciliar ecumenism, the attitude and influence of the neo-evangelicals, the cooperative evangelism of Billy Graham, and the position of the non-aligned denominations, such as the Southern Baptist Convention, the Missouri Luthern Church, and the Church of the Nazarene. The concluding chapter seeks to clarify misconceptions and to show some important areas of rapprochement between the conservative and ecumenical positions. Ground rules for a fruitful dialogue are suggested.

Summary. Conciliar ecumenism is accused of espousing Catholic ecclesiology, unity at the expense of doctrinal compromise, and socialistic ideologies. Many conservative evangelicals believe that the unity, catholicity, and holiness of the Church must await future eschatological events for their visible manifestation. Finally, the ecumenical organizations are accused of lack of representation and "grass roots" support. The structure and the activities of the Councils are seen as those of a "growing super-church" resulting in regimentation and monolythic institutions.

The conservative critique is being moderated by unity efforts and cooperative organization among evangelicals, presenting an effective challenge to local and denominational separatism. "Neo-evangelicals" show a willingness to learn new truth from the Scriptures, to allow greater doctrinal flexibility, to apply the Christian gospel to social problems, to define more cautiously what constitutes apostasy and compromise, to criticize the negative aspects of fundamentalist mentality, and to make many of the ecumenical concerns their own.

Evaluation and Conclusions. Two factors tend to dull the edge of conservative criticism: (1) Many of the dangers cited are more clearly and comprehensively recognized in ecumenical circles; (2) conservatives are often

inconsistent in their applications of Scripture, social thought, and spiritualizing Church concepts.

Among major misconceptions are their assumptions that conciliar ecumenism denies the already given unity of the Church; that it is dominated by theological and social liberalism; that it ignores the non-theological factors; that it prejudges the nature of the ultimate unity; that it seeks unity through addition, doctrinal compromise, and organizational uniformity; that it neglects the eschatological aspects; and that it is not based on a Scriptural and trinitarian foundation.

Valid contributions of the conservative evangelical critiques appear to be their concern with the continuity of the orthodox Christian faith, their insistence that Christians should mean the same things when they use common terminology, their charge of laxity in church membership standards and discipline, their emphasis on the need of personal regeneration and total commitment, their stress on man's dependence upon the will and workings of God, and their warning of the dangers of institutionalism and misrepresentation.

Possibilities of rapprochement lie in a common concern for finding the will of God regarding unity in Scripture, for applying the gospel to personal as well as social salvation, for translating spiritual realities into action "so that the world may believe," and for making the living Christ the center of unity beyond Scripture and dogma.

A fruitful dialogue between conservative evangelicalism and conciliar ecumenism appears both essential and possible. Generally speaking, evangelicalism is moving away from the extremes of fundamentalism while theological liberalism is a diminishing factor within ecumenism.

Microfilm $3.90; Xerox $13.75. 303 pages.

THE GOAL AND MEANS OF THE COMMUNIST SOCIETY: A CHRISTIAN ETHICAL ANALYSIS.

(Order No. 61-3058)

Zoltan Joseph Fule, Th.D.
Union Theological Seminary in the City of New York, 1961

Although Communism asserts it has a materialist basis and is not the fruit of abstract ethical ideas, it claims that by establishing right economic foundations it creates moral values among which social justice is considered to be the highest. Communism claims to create the most just and most humane society on earth in which all the burning social problems of the whole mankind will be solved. Such a claim is one of the greatest challenges for Christian social ethics. This thesis intends to examine the society which Communism wants to build by analyzing systematically the "good" in its goal and means toward this end from the point of view of Christian ethics.

In dealing with Communist theory, the primary sources of the thesis are the works of the founders of modern Communism (Marx and Engels), and of the successive leaders of the society that first professed to be Marxist (Lenin, Stalin and Khrushchev), noting the special contributions and modifications of the latter ones. Concerning practice, the concrete instance examined here is the Soviet society in which the building of Communism has progressed the farthest. Christian ethics as used in the thesis is Protestant social ethics which considers the consequences of the reality of sin in man and his social life; it strives for the relatively better and the best possible social justice in the light of the Word of God.

After an introduction, Chapter II analyzes the Communist goal of justice from the point of view of equality. After the Communist criticism of both the bourgeois and socialist—equalitarian conceptions of equality, the chapter presents the Communist conception. It examines then the corresponding collective economic-social basis and the collectivist society built on it, its claims to economic and moral superiority, and the problems of new inequalities created by this society.

Chapter III considers the Communist goal of justice from the point of view of freedom. It analyzes the historical, collectivist, and utopian aspects of the Communist conception of freedom. Here is examined how far the Communist interpretation of freedom is realized in the fundamental laws and rights, and in actual practice in the Soviet society which builds Communism. Finally, the recent "liberalization" and its possible scope within the system are analyzed and evaluated.

Chapter IV examines the road which is used to reach the goal of justice. This is characterized by violence, which can be recognized, either in the strict or the broad sense of the term, as the most essential feature in all the basic means of building the Communist society. The means analyzed here are the "socialist" revolution, the dictatorship of the proletariat, the monolithic Party, and the maximization of the Soviet /"socialist"/ state power.

In conclusion this thesis summarizes the criticism concerning the Communist interpretation of equality, freedom and violence. It points out how the means used for the building of Communist society run counter to its own goal, leaving more of their reactionary stamp on this society than does its partly utopian, partly progressive goal. It points out that instead of approximating its goal and building up the appropriate ways and means of progress to advance toward it, the communist society in process of realization is moving farther and farther from its goal. This society may be very effective in some respects, but concerning its own goal it certainly has not succeeded. For Christians and non-Christians the original programme has been a challenge; its failure may be an even greater one. Finally, the concluding chapter deals with the problem of a necessary and possible responsible response to this twofold challenge.

Microfilm $4.45; Xerox $15.75. 346 pages.

AMERICAN PROTESTANTISM AND WORLD POLITICS, 1898-1960: A TYPOLOGICAL APPROACH TO THE FUNCTIONS OF RELIGION IN THE DECISION-MAKING PROCESSES OF FOREIGN POLICY.

(Order No. 61-3367)

Alan Francis Geyer, Ph.D.
Boston University Graduate School, 1961

Major Professor: Walter G. Muelder

Problem. It is the primary problem of the dissertation to develop a schematic and comprehensive approach to the

empirical study of the relationships between Protestantism and American foreign policy in the modern period, 1898-1960. There is a secondary and normative concern: to define these relationships in such a way as to guide the most fruitful further research and the most responsible religious action.

After 1898, American foreign policy increasingly came to require a "total diplomacy." At the same time, Protestantism was developing a "total religion." This parallel expansion of national interests and religious interests to ultimate boundaries made the relationships between them complex beyond the ready apprehension of leaders and scholars in both politics and religion. Neither the ethicists nor the empirical students of religion have developed a theoretical structure adequate for the understanding of religious behavior in world politics.

Method. The dissertation develops a typology which seeks to (a) extend the theoretical structure of the sociology of religion so as to become more applicable to world politics; and (b) demonstrate the sources of insight available to church-state theory and political ethics when they focus upon the dynamic relationships between religion and politics in their inevitably transnational aspects.

The typology is constructed upon a triangular foundation: a functional approach to religion, a dynamic and behavioral theory of international conflict, and a model of decision-making in foreign policy. The functional approach to religion permits the construction of an inventory of sixty simple statements which summarize previous research and which may be grouped for typological classification. Two radical categories of loyalty and conflict are apprehended as corresponding to the cohesive and divisive properties of religion. The sustained methodological goal is to provide instruments for the sharpening of perception of religious influence upon foreign policy.

Conclusions. The six-fold typology finally elaborated embraces the following: (a) religion as a source of loyalty; (b) religion as a sanction for political loyalty; (c) religion as a sanction for political conflict; (d) religion as a source of political conflict; (e) religion as a sanctuary from political conflict; and (f) religion as a reconciler of political conflict.

All of these types, inherent in the doctrine of the Covenant, were mediated to Americans principally through the "Puritan ethos." In the modern period, Woodrow Wilson and John Foster Dulles most decisively recapitulated the Puritan ethos and its peculiar combination of nationalism and internationalism. In both war and peace, Protestant action has participated in the excesses of moral enthusiasm which have produced the most opposite effects upon foreign policy. The domestic ambivalence of the Puritan ethos has been witnessed in its polarities of political crusade and political alienation.

Ecumenical and missionary leaders have sought to identify Protestants with "supranational" loyalties. There is, however, a serious "opinion gap" between Protestant pronouncements and the prevailing sentiments of lay members. New institutional strategies are required. Theological education must include responsible opinion leadership within its curriculum. Lay leadership requires a radical reorientation to the disciplines appropriate to a more responsible public: controversy, conflict, compromise, consensus.

The full meaning of "the message of reconciliation" is inseparable from a "theology of conflict" in which religious and political claims encounter one another as creatively as possible. The final logic of political ethics for the Christian is that his most perfect expression of transcendent loyalty is to subject himself to the secular community in its law and force and controversy; thus does he come to know the political meaning of the Crucifixion which is prior to, but fulfilled in, the ultimate meaning of the Crucifixion. It is only as the radically committed Christian internalizes the most acute struggles of his human world that he becomes an ambassador for Christ engaged in the ministry of reconciliation.

Microfilm $5.90; Xerox $20.95. 462 pages.

THE INFLUENCE OF HEINRICH BULLINGER AND THE TIGURINE TRADITION UPON THE ENGLISH CHURCH IN THE SIXTEENTH CENTURY

(Order No. 61-3597)

Frank Gulley, Jr., Ph.D.
Vanderbilt University, 1961

Supervisors: Professor Daniel Bard Thompson
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There is a tendency in historical scholarship to project the dominance of seventeenth-century Calvinism back upon the sixteenth-century and thereby to conclude that Calvin and Geneva prevailed over the Reformed world in their day as their heirs throughout Europe did a half-century later. But such was not the case. To be sure Calvin and Geneva were greatly influential in developing the Reformed tradition of the sixteenth-century, but there was another Reformed center of great influence: Zurich, under the reforming hand of Zwingli and his eminently capable successor Heinrich Bullinger. Zwingli fashioned the reformation in Zurich in the years 1519-1531. But his work would probably have been destroyed after the Second Battle of Kappel (1531) if it had not been for the wise, prudent, and courageous leadership of Bullinger who guided the Tigurine church from 1531-1575.

Bullinger was greatly concerned for church reform throughout Europe. He was in constant communication with the numerous leaders of reformation activity on the continent and in England, giving them encouragement in their labors, but more important, advice and counsel, which was gratefully received. Because the reformation struggles of England were of particular interest to him, it is the purpose of this thesis to explore the lines of influence from Bullinger and the Tigurine church to the emerging reformed Church of England in the period 1531-1575.

Tigurine influence entered England via three media:

(1) Personal contacts between Tigurine churchmen, principally Bullinger, and English clerics. In the period 1530-1553 numerous English theological students journeyed to Zurich where they studied at the feet of Bullinger and the eminent theologians of the theological faculty (prophezei). The most important of these students was John Hooper, later bishop of Gloucester (1550-1555). It can be said in

truth that Hooper was a disciple of Bullinger in the fullest sense of that word. When we remember that Hooper has traditionally been titled the "Father of English Puritanism," we can appreciate the great importance of Bullinger and the Tigurine church for the inception of the Puritan movement in England.

In the reign of Edward VI several continental theologians of Tigurine vintage made their way to England for a sojourn of several months. John à Lasco, Peter Martyr, and Bernardine Ochino were prominent in this group. They exercised a great influence upon archbishop Thomas Cranmer and other persons of high rank both in the church and in government.

When Mary became queen in 1553, hundreds of Protestants sought asylum on the continent. It was not by accident that Zurich was chosen by many of them as a place of refuge. Indeed Zurich sheltered a significant body of English theological students who, upon the accession of Elizabeth, provided a large portion of the leadership for the restored Church of England. No less than seven future bishops and one archbishop of the Elizabethan church sojourned in Zurich in this period. The volume of the correspondence between them and Bullinger in later years attests to the depth of their friendship for him, and the contents reveal how greatly he was their counselor and confidant.

(2) Published writings of all sorts were the second medium of Tigurine influence. From his earliest days as leader of the Tigurine church Bullinger kept couriers busy running to England with complimentary copies of his published works to Englishmen of influence, both ecclesiastical and political. The frequent references to these gifts in the extant correspondence between Zurich and England can only lead one to conclude that Bullinger was vitally concerned to influence the reformation taking place in England. Some estimate of his success is possible when we realize that no less than thirty-one of his Latin and German treatises and books were translated into English and published for general circulation during the period 1531-1575. Special reference should be made to Bullinger's Decades (four volumes of fifty theological sermons), most of which were dedicated to Edward VI and declared by the convocation of Canterbury in the Elizabethan church to be required reading for a large segment of the clergy. No other continental theologian in the sixteenth century was so honored officially by the Church of England.

(3) The third medium of Tigurine influence was correspondence. Bullinger and his ecclesiastical associates were in constant correspondence with a multitude of Englishmen of all stations of life. From bishops and archbishops and ministers of state to parish priests and ordinary laymen, letters poured into Zurich seeking his counsel. The Puritan struggles of the Elizabethan church reveal how important this correspondence was. Each side of the controversy argued its case before Bullinger as if he were the judge. From far away Switzerland he wrote his comments which were respectfully received as if from a spiritual father.

Two principal results can be traced to Tigurine influence in England: (1) Through Tigurine influence the Reformed faith was introduced into England; (2) To a large degree the sources of English Puritanism must be traced to Zurich and the influence of Heinrich Bullinger.

Microfilm $4.00; Xerox $13.95. 309 pages.

THE PLACE OF RELIGIOSITY IN THE SELF-REPORTS OF NEGRO STUDENTS IN A CHURCH-RELATED COLLEGE

(Order No. 61-3403)

Roland Emerson Haynes, Ph.D.
Boston University Graduate School, 1961

Major Professor: Paul E. Johnson

1. The Problem

The problem of this dissertation is to determine if there is any significant difference between the way students of high and of low religiosity view themselves. "Religiosity" refers to religious behavior in church attendance and contributions, in reading religious literature, and in affirming religious belief.

2. The Method

This study tested religiosity by using Strunk's Wesleyan Religiosity Index, which was administered to 186 students, enrolled in a required first year course. Of these, 74 students were classified as "high religiosity," and 50 as "low religiosity." The scores in religiosity were then correlated statistically with the self-reports of these students. To evaluate the self-reports and personality characteristics of the students involved, five other standard tests were administered.

3. Conclusions

(1) For the most part, Methodist and Baptist groups did not vary significantly in self-evaluation.

(2) On the other hand, the self-evaluation of the Methodist and Baptist groups differed significantly with respect to the discrepancy between self-rating and other rating on the Index of Adjustment and Values.

(3) The female high and male high religiosity groups differed significantly with respect to the religious values. Likewise, the female high and the male high, and the female low and male low, differed significantly in terms of the religious conflict and orthodoxy.

(4) The personality factors were measured by the Neurotic Personality Factor Test. These factors were defined in terms of the raw score, neurotic stability rank, and the discrepancy score. The female high religiosity group showed greater emotional stability than the male high. The female low religiosity group showed greater emotional stability than the male low.

(5) Students scoring high on religiosity tended to be less theoretically, aesthetically, and economically oriented, but more socially, politically and religiously oriented.

(6) Students scoring high on religiosity showed no consistent positive or negative self-images. Baptist students scored significantly higher on the self-concept, self-acceptance, and the ideal-self than the Methodist students.

(7) Signs of religious conflict are more evident in the case of high religiosity groups than low.

Students who scored high on religiosity also scored high on the orthodoxy variables of the Funk Experimental Scales. This shows religion for these students to be a tendency to accept religious authorities and conform to prescribed religious practices. We may infer a restless submission here, for these same students also scored high on religious conflict.

(8) Male students tended to score higher in neurotic tendencies than the female students. The female high religiosity group reported more orthodoxy and appreciation for social, political, and religious values. We may infer that the less orthodox males are aware of more religious and neurotic conflict.

In summary, the hypothesis of this study was generally supported; namely, that self-reports show no significant difference in the self-evaluation, consistency, and certain personality factors of students of high and of low religiosity. It indicated that religiosity is not the decisive concern for these students. It appears that the entire culture and interpersonal relationships are more important to them than the single factor of religiosity. However, in the crucial struggle with orthodox patterns of religion, students undergo anxiety, religious conflict, and ambiguous self-images. A genuine search for an understanding of themselves in relation to the demands of the church-related college may impel them to reconsider traditional religious forms. In such a time of searching there is strategic opportunity for religious teaching in a supportive college community.

Microfilm $3.50; Xerox $12.15. 270 pages.

THE PROBLEM OF BIBLICAL AUTHORITY: A CRITICAL STUDY OF SOME RECENT AND CONTEMPORARY AMERICAN PROTESTANT THEOLOGIANS REPRESENTATIVE OF EVANGELICAL LIBERALISM, CONTEMPORARY ORTHODOXY, AND NEO-REFORMATIONISM.

(Order No. 61-3885)

Arnold Withrow Hearn, Ph.D.
Columbia University, 1961

Recognizing the current prominence and perennial centrality of the problem of biblical authority in Protestant theology, the study analyzes the three major contemporary types of approach to the problem as these are represented by a number of American theologians and biblical scholars. All three types are interpreted as responses to the confrontation between the historic Protestant emphasis on the crucial significance of Scripture as the vehicle of divine revelation and those facets of modern thought (especially biblical criticism) which challenge the tenability of the traditional conception of the nature and authority of the Bible.

Evangelical Liberalism, represented by W. N. Clarke, W. A. Brown, H. E. Fosdick, J. A. Bewer, E. F. Scott, L. H. DeWolf, and others, identifies itself with the humanitarian, democratic, and scientific outlook of the modern mind and seeks to reconstruct its understanding of the nature and function of Scripture accordingly, utilizing a stress on God's immanence throughout creation and an evolutionary, progressivistic interpretation of history. God's unfolding self-revelation is largely identified with humanity's advancing moral and religious discovery. These thinkers formulate a conception of the Bible as the highest literary reflection of the religious experience of mankind, supremely exemplified in Jesus.

Contemporary Orthodoxy, represented by E. J. Carnell, B. Ramm, C. F. H. Henry, P. K. Jewett, E. F. Harrison, N. B. Stonehouse, and others, perpetuates the traditional doctrine of biblical infallibility, but recognizes the necessity of reinterpreting it so as to satisfy modern objections. By stressing the progressive character of revelation, its accommodation to the cultural and psychological contexts in which it is given, the distinction between normative and historical authority, and by interpreting the inerrancy of biblical statements in terms of the canons of accuracy current at the times and places of their composition, these thinkers are enabled to embrace a number of the conclusions of biblical criticism which are commonly supposed to be irreconcilable with the doctrine that the Bible is infallible. Thus they attempt to render the traditional doctrine a live option for the modern mind.

Neo-Reformationism, represented by H. R. Niebuhr, R. Niebuhr, W. Hordern, J. Knox, P. S. Minear, G. E. Wright, F. V. Filson, B. W. Anderson, and others, accepts the fully human character of the Bible and the validity of criticism, but also asserts the uniqueness of Scripture and its cruciality to the life of the church as the normative witness to a historical and Christocentric revelation. Special stress is placed on God's self-disclosure through historical events apprehended by faith and on the dramatic (rather than evolutionary) unity of revelation's development. In formulating its view of religious authority, this outlook relies heavily on arguments for the primacy of faith (or ultimate commitment) as providing the pre-reflective perspective within which reason operates in quest of understanding.

A special effort is made to present each viewpoint sympathetically, correcting common stereotypes and caricatures and calling attention to its valid contributions. The perspective from which critical evaluation is undertaken is largely provided by Neo-Reformationism.

The study concludes that Evangelical Liberalism fails to do justice, in its conception of authority, to the confessional element in its own outlook and uncritically assumes the validity of a cultural ethos now in process of disintegration. Contemporary Orthodoxy is found unsuccessful in its attempt to combine scholastic rationalism with modern empiricism, managing to preserve the doctrine of biblical infallibility only formally, while losing its vital content. Judging Neo-Reformationism the most promising option, the author guards against absolutizing it as the permanent solution of the problem and finds its representatives sometimes in serious danger of losing some of the movement's essential inheritance from Liberalism and moving toward obscurantism and unfortunate isolation from the currents of modern culture.

Microfilm $6.20; Xerox $21.85. 485 pages.

ALEXANDER CAMPBELL'S THEOLOGY OF MISSIONS

(Order No. 61-3739)

George Frederick Wolvin Kresel, Th.D.
Boston University School of Theology, 1961

Major Professor: Dr. L. Harold DeWolf

Alexander Campbell was born in Ireland in 1788, but moved to America in 1809, where he lived until his death in 1866. Campbell is one of the founders of the Disciples of Christ (Christian Churches).

Campbell's theology of missions grew out of his attempt to call to the attention of the American churches, first, the extent to which their structure, worship, and doctrine had grown beyond the New Testament characterization of the Apostolic churches, and, second, the evils of denominationalism. Campbell found missions agencies existing that were attempting to do the work of the church, but were not appointed by the church. According to Campbell, the church must be united, and then must form its own missions agencies. Campbell's critics thought his attack upon missionary societies meant that he opposed missions. Some of that criticism is found today in commentaries upon Campbell's theology.

Campbell wrote no book on missions. In order to establish the content of Campbell's theology of missions, it is necessary to compile from his books, articles, and published debates, any pertinent references and implications, categorize this material, and then correlate it with any conditioning factors, such as Campbell's activities, the status of the brotherhood's development, and dissenting criticisms. Campbell's writings were occasional in that they were penned in response to recognized need. The assumption must be made that these isolated statements were written on the basis of some basic concept which Campbell had, but which he did not express systematically in a treatise.

Emerging from such a methodology of categorization and correlation is a theology of missions which is strikingly contemporary in its understanding. Characterizing each of the major points of Campbell's theology of missions is a significant concept of the worth and dignity of personality. Campbell believed that missions is based on the desire to have men become Christians so that they may enjoy in this life an earnest of the life to come. Missions must not attempt to save man apart from his brothers and his environment because a Christian cannot exist in isolation. Second, Campbell believed his theology corrected the moral inconsistency of Calvinism. Salvation is offered by God, and is accepted or rejected by man. God does not impose his will, but respects human volition. Those who do not have the opportunity to hear, and thus to choose, are saved if their lives comport with the best and highest knowledge they possess. Third, Campbell warned the nineteenth century to distinguish between the betterment of man's environment and the betterment of man. Man, in the best of environmental conditions, still needs salvation. Fourth, Campbell recognized the value and dignity of the non-Christian religions without compromising Christian uniqueness. He was able to retain a definition of Christianity which did not exclude or degrade other religions and religious cultures. His emphasis was that the non-Christian faiths were inadequate, but not completely erroneous. Fifth, Campbell provided for indigenous native churches who are part of the general fellowship of Christians, rather than subordinate members of the fellowship. Sixth, Campbell's theology of missions took into account the ecumenic nature of missionary work, and recognized the major questions to arise in ecumenic discussion.

Microfilm $5.35; Xerox $18.90. 419 pages.

THE ROLE OF REASON IN THE APOLOGETIC ENTERPRISE OF EMIL BRUNNER AND PAUL TILLICH IN RELATION TO THE MYTHS OF GENESIS ONE TO THREE

(Order No. 61-4804)

John Frederick Little, Ph.D.
Princeton University, 1961

On the assumption that apologetics is vital to the life and influence of the Christian Church, this thesis probes the problem of what constitutes a legitimate apologetic method (Chap. i, "The Problem") by analyzing, comparing, contrasting and evaluating the role of reason in the apologetic methods employed by Emil Brunner and Paul Tillich. Because the nature of reason as created by God and distorted by sin is significant for a theological appraisal of reason's competence, the interpretation Brunner and Tillich place upon the myths of the Creation and the Fall serves as a frame of reference for the discussion and evaluation.

An examination of the philosophical and theological orientation of each of the two thinkers (Chap. ii, "Perspectives") is followed by a presentation of Brunner's interpretation of the Genesis myths in terms of biblical personalism and of Tillich's reconstruction of them as universally applicable symbolic portrayals of the relation of finite reality to "Being-itself," which is Tillich's definition of God (Chap. iii, "The Creation and the Fall"). In analyzing the epistemology consonant with these personalistic and ontological interpretations of the myths, it becomes apparent that, according to Brunner, the autonomous reason of fallen man is too abstract to have any true knowledge of the Divine Person, whereas, according to Tillich, the ontological immanence of God in man gives to human reason a "depth dimension" by which man is immediately aware of Being-itself from which he is existentially estranged (Chap. iv, "Epistemology in Relation to Mythology"). Because fallen reason regards its autonomy as axiomatic, Brunner maintains that it must be conquered by revelation, whereas Tillich maintains that reason can ask the question about the revelation of that from which it is estranged and receive revelation by means of its depth dimension (Chap. v, "The Cognitive Character of Revelation"). Brunner's fundamentally negative conception of fallen reason and of its relation to revelation issues in his method of eristics according to which reason opens man to the Christian message by frustrating his efforts to understand himself. Tillich's fundamentally positive conception of reason and of its relation to revelation issues in his method of correlation according to which reason reformulates the Christian message to answer the questions raised by a philosophical analysis of the human situation (Chap. vi, "The Role of Reason in Apologetics").

On the grounds that (a) Tillich's conception of God as Being-itself must be rejected as mystical and monistic,

(b) Brunner's pessimism regarding the cognitive capacity of fallen reason requires modification, and (c) a dialectical conception of the relation between the special revelation in Christ and the general revelation in creation demands that the knowledge deriving from the latter be taken seriously, the evaluation attempts to eliminate the weak and synthesize the strong points of the two positions (Chap. vii, "Reconstruction and Critical Evaluation"); and concludes (a) that by emphasizing the element of "truth" as well as the element of "distortion" in Brunner's notion of "distorted truth," it is possible to go beyond Tillich's critical ontology to a constructive metaphysics which interprets the whole of experience as the general revelation of a personal God; (b) that a method of "transformation," though identical with neither, retains what is best in the methods of "eristics" and "correlation"; and (c) that the most promising rapprochement between philosophy and faith appears to lie in the possibility of a "Christian philosophy" which, despite Tillich's objections, need not be regarded as a contradiction in terms, but which, at the same time, goes beyond Brunner's conception of it as peripheral theology by allowing reason freely to articulate the Christian universe which faith envisions.

Microfilm $6.00; Xerox $21.20. 469 pages.

SOCIAL ORDER AND PERSONAL INTEGRITY: SOME CHRISTIAN VIEWS OF AUTHORITY.

(Order No. 61-3600)

Helen Louise Panigot, Ph.D.
Vanderbilt University, 1961

Supervisor: Professor James E. Sellers

Purpose: to search out the insights within the Christian faith which throw light on the question of authority in relation to social order and the integrity of persons affected by that order. This study is neither a historical survey of Christian social theory nor an exhaustive analysis of one particular period. It attempts to show the rootedness, continuity, and creativity in the relationship of God, man, and society--as seen in their involvement in the historical situation at critical periods which have served as turning-points. This logic of ideas, events, history has directed choice of materials used. Certain arbitrary limits of keeping this study to manageable proportions dictated further choice from relevant materials of any period. Only those aspects of any representative Christian's thought relevant to the main issues of this study have been utilized (with due sense of context to avoid distortion).

A certain chronology is demanded by the logic of these problems of man and society within the Christian framework: certain developments could not have come in the way they did except as arising from the bequest of the past. But chronology is not the basic principle of organization. One principal theme is of a polarity which holds in creative tension the two ends of authority--social order and integrity of persons. This dialogue of ends provides a continuing center of unity and a creative thrust as new understandings, new applications and procedures have resulted within the actual historical situations.

Both ends find fulfillment in the Christian community where each man is a responsible and significant person by virtue of his relationship to God. As God's purposes for man and society, these ends point to God as source of the authority which should serve them. This source and these ends constitute the limits of all authority exercised by human agents. As to whether these ends are applicable to the civil society or only within the Christian community, Christian thought has differed. Four persistent threads recur, variously combined, in Christian attitudes toward the state: (1) de facto acceptance, (2) a normative thrust, (3) the state necessitated by sin (often characterized by a perfectionist rejection), and (4) as expressing the divinely created order.

This Christian sense of community and persons has come into creative interplay with the larger social structures. To the extent that these ends have provided motivating spirit and dynamic in this cross-fertilization of idea and practice, the resultant culture has been called Christian in a significant (but not absolute) sense. Impersonal order, peace, justice--as classic norms of the commonweal of the social whole--were modified decisively by the recognition of persons as also an end. This emphasis has stimulated the thrust toward equality of rights, justice as the social recognition of rights, law as guarding those rights, and freedom as an instrument toward producing responsible persons.

The slow development of necessary institutions, of practical processes and structures to safeguard both ends has eventuated in liberal democracies. No protection against the pathology of authority exists except widespread knowledge that this creative relationship of ends is necessary and possible, and the courage of faith of multitudes who will work to preserve and perfect it.

The chapters: (i) the problem of authority and the Christion affirmation; (ii) and (iii) the ends of authority: the good of the social order, the integrity of persons; (iv) the validation and limitation of authority; (v) the exercise of authority: locus, instruments and institutions.

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THE CONCEPT OF "GOD IN HEAVEN" IN ISRAEL.

(Order No. 61-3377)

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Boston University Graduate School, 1961

Major Professor: Harrell F. Beck

The development of the "God in Heaven" concept in Israel's religion epitomized her religious development. There was an early period when Israel knew her God primarily as the deity of the mountain and the storm. Later, when the nation passed from a nomadic to an agricultural society in Canaan, Yahweh was known in the cult, especially in such devices as the Ark and Temple. Finally, under the duress of foreign intimidation, Yahweh, the God of history, was believed to have assumed extra-spatial qualities, and was worshipped as the deity who transcended time and space.

In the various stages of this development from a localized deity to the "God in Heaven," social customs influenced

Israel's life significantly, but the need to give a greater degree of reality to Yahweh's immediate presence was strongly felt. Under the Covenant Israel had personal, direct contact with her God. Once the Covenant was threatened by foreign occupation, Israel compensated for the loss of the immediate presence of deity by placing Yahweh beyond the threat of foreign intimidation, that is, beyond the threat of temporal and spatial limitations. In this transition, Yahweh's new place of residence was fixed; from it he could return to his people or dispatch his messengers to them. "The Heaven of Heavens" became this retreat of Yahweh from which he ruled and guided Israel. Once Yahweh was termed "the God in Heaven," Israel attributed to him many of the same powers which she had attributed to him when he was thought to be enthroned in the land.

The idea of the transcendence of Yahweh in Israel had its counterpart, and possibly its origin in the religions of surrounding nations. Many of these religions had gods who ruled supreme or "in the heavens" and who were thought to be beyond time and space. Therefore, an examination of the concept of "God in Heaven" in Israel has necessitated an investigation of these religions: Egyptian, Phoenician, Babylonian, Persian and Greek. One deity in each of these pantheons was apparently supreme and has therefore been considered in the context of the relevant national religious system.

Next, Israel's idea of a "God in Heaven" has been investigated in the light of her religious thought. The period of the Exile had profound effects on the religious thinking of her people. As a consequence of this experience Israel attempted to develop a religious commonwealth which could exist in the midst of any political state, however foreign or dominant. Israel's thinking about death, sin retribution, and the future life changed notably in these post-exilic times.

Finally, an attempt has been made to understand the deeper religious meaning of the "God in Heaven" concept in Israel's religion. Yahweh was the supreme deity of Israel; his ethical and moral qualities were taken with great seriousness by the Israelites. Yahweh was thought to inhabit "the Heaven of Heavens," a residence beyond the physical realm of man; from that realm God made contact with man by means of messengers. Even though Yahweh was thought to be transcendent, he was also thought to be ever-present in Israel.

However, the greatest lesson learned by Israel from the Exile, the universalism of Yahweh, was forgotten because Israel refused to accept the responsibility for the missionary task assigned and entrusted to her by her God. Instead of delivering his salvation to the world by becoming "a light to the Gentiles," she tried to keep it solely for herself. Israel's selfishness dimmed her idealism, weakened her dedication, and led to the rise of secularism in Israel.

This investigation into Israel's religion has been based on canonical and deutero-canonical literature, as well as archaeological evidences. The investigation of the religions of Israel's neighbors has been based on their literary records and relevant archaeological data.

Microfilm $3.85; Xerox $13.50. 298 pages.

BECOMING A MYSTIC: AN ANALYSIS OF DEVELOPMENTAL FACTORS ACCORDING TO THE MURRAY "NEED-PRESS" THEORY.

(Order No. 61-3390)

John David Spangler, Ph.D.
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Major Professor: William G. T. Douglas

This study investigated the early lives of certain mystics from a psychological standpoint, assuming that mysticism is subject to the same type of forces and factors as any other human behavior. (For the purposes of the dissertation, a mystic is defined as one who centers his life on God and strives for "union" with him.) Questions of theology and philosophy were excluded from the study, and focus was made on the experience of the mystics.

Biographies and, where available, autobiographies of the mystics were analysed and rated using the categories developed by Henry A. Murray et al., known as the "need-press" theory.

Only those elements susceptible to analysis using extant psychological methods and techniques were considered. The mystics were limited to those from Western Christendom. Because of the subjectivity involved in the classification of the biographical materials, a second rater independently rated the same materials. The two raters agreed on more than three-fourths of the classifications; Pearson correlations ranged from .86 to .97.

A pilot group of ten mystics, selected for prominence, representation of both sexes, and a spread in time, was analysed using Murray's 210 categories, to which five necessary additions were made. Since these 215 categories were too fine for the type of material being analysed, they were collapsed into sixty-one grosser categories, and from these the twenty-five most frequently occurring factors were selected as the schema for further investigation.

Biographies of twenty-five additional mystics, selected on the same basis as the pilot group, and case records of twenty-five schizophrenic mental patients, selected roughly to match the mystics in intelligence, sex ratio, and religious affiliation, were analysed using the twenty-five categories. The resulting data were used to test hypotheses about the psychodynamics of developing mystics and schizophrenics and possible relationships between mysticism and psychosis.

It was found that mystics and schizophrenics both tend to come from environments affording little security to the child. Many of both groups experienced the lack or loss of companions or possessions. This combination tended to produce a high degree of dependency and a tendency to be seclusive and withdraw from the world. The uncertainty of satisfaction and reward also seems to have produced strong superegos in both groups.

Although both felt the force of emotional rejection by family or friends at times, the mystics had more "positive" elements in their early environments than did the schizophrenics, receiving praise and acclaim from parents and friends. In addition, they felt their parents to have aims and goals for them and felt themselves indulged occasionally. The greatest difference, however, is the presence of religious training in the mystics' backgrounds but not in the schizophrenics'.

Perhaps because of these positive factors the mystics

were able to form some strong relationships with others and to have an outward orientation. They were much more self-abasing in some situations and more self-assertive in others than were the schizophrenics. Intensity and the need for achievement were other factors differentiating the two groups.

Typically, the mystic re-oriented his life increasingly toward God and tended to solve his superego and dependency needs through this relationship. To the typical mystic God is a psychic reality who, he believes, both does things for him--sustains and protects him--and requires things of him--morality, worship. Religious training through example and religiously concerned parents were part of the mystics' early lives; these helped them develop religiously oriented lives.

It is hoped that this beginning can be carried on in the investigation of other groups so that the background factors of mysticism can be isolated and identified further.

Microfilm $2.75; Xerox $8.80. 193 pages.

SOLOMON STODDARD: PURITAN PATRIARCH, A BIOGRAPHY.

(Order No. 61-3391)

Harry Gerald Swanhart, Ph.D.
Boston University Graduate School, 1961

Major Professor: Edwin P. Booth

This dissertation presents the biography of Solomon Stoddard, 1643-1729, and evaluates his contribution to New England Puritanism. To achieve these goals an examination of numerous sources, civil and ecclesiastical records of Boston and Northampton, Harvard College records, and numerous other data providing fragments of biographical detail, together with extensive reading of Puritan literature was undertaken. The form is narrative, and the underlying thesis is to sustain or refute Puritan hagiography, which has either ignored Stoddard or condemned him as a malefactor.

Stoddard's life spanned a significant and critical period in the development of Puritanism in New England. In a long and distinguished career as minister of the Northampton Church, and ecclesiastical spokesman for the Connecticut Valley, he exerted an influence over ecclesiastical affairs surpassed by none of his contemporaries. However, notwithstanding the historian's familiarity with Stoddard's name, only rare attempts have been made to shed some light on his career.

Born in Boston, son of Anthony Stoddard, merchant and magistrate, and Mary Downing, niece of John Winthrop, Solomon distinguished himself at Harvard College, where he was being prepared for the ministry, as scholar (B.A., 1662, M.A., 1665), Fellow and Librarian. Poor health forced his departure, and upon recovery he accepted a call to journey to the wilderness community of Northampton, in the Connecticut Valley, where he labored sixty years, fulfilling the multifarious duties of a frontier clergyman: preacher, scholar, teacher, farmer, businessman, and man of public affairs.

Stoddard's significance lies in his redefinition, or, as his opponents asserted, his corruption, of Congregational polity. His proposals were presbyterian in nature and evoked the reproaches of the apologists for the pure primitive way of Congregationalism. The principle question is not the form of church government, but rather, what induced Stoddard to repudiate the Congregational pattern, and promote a revolutionary scheme?

Among the original settlers in Massachusetts Bay the Congregational form of polity prevailed; i.e., a church was a particular or autonomous society of "saints," bound together by a covenant. It rested upon the assumption that personal regeneration was a universal experience among righteous folk, and this experience became the sole criterion for church membership. In this way the churches would be perpetuated, ad infinitum. The expectation was not fulfilled. Doubts as to the validity of this scheme emerged, but they were ignored, and in 1648 the system was endorsed by an ecclesiastical assembly and sanctioned by the civil government.

In Puritan conviction the New England theocracy based upon the Congregational polity was divinely decreed, yet cracks in the walls began to appear. Here were impiety, indifference and heresy growing daily more powerful than the holy commonwealth. This decline implied that something had gone wrong, but what? To Increase Mather, it was a waywardness from the practices of the first generation, summarized and canonized in the Platform. To Solomon Stoddard, the decline of visible piety and the diminution of the churches were due not to ecclesiastical infidelity, but to the impracticality of the original vision. To correct the situation he recommended several proposals, commonly called "Stoddardeanism," which may be summarized briefly: (1) the disavowal of the covenant-origin of a church; (2) rejection of Congregational "particularism"; (3) curtailment of lay authority; (4) creation of a "national" church to replace particular churches; and, the most unique, (5) the sacraments as "converting" ordinances.

These recommendations evoked from Increase Mather charges of "heresy" and "innovation," the most damning words in the Puritan lexicon. Amid rage and disbelief Increase asked how a member of "Israel" could work to subvert the churches. His intransigence, limited vision and devotion to erstwhile Puritan grandeur, made Increase Mather impervious to the reasonableness of Stoddard's proposals.

Microfilm $5.10; Xerox $18.00. 398 pages.

THE SOURCES OF THE IDEA OF ACTIVE RESISTANCE IN THE POLITICAL THEORY OF JOHN KNOX

(Order No. 61-3376)

Wesley James Vesey, Ph.D.
Boston University Graduate School, 1961

Major Professor: Edwin P. Booth

The problem of the dissertation, "The Sources of the Idea of Active Resistance in the Political Theory of John Knox," is twofold: (1) to present the major tenets of the political theory of Knox, (2) to indicate the sources of the idea of active resistance revealed in that political theory.

The major portion of the study falls within the limits of the sixteenth century.

Following the presentation of the major aspects of Knox's political theory, the study proceeds to the analysis of the sources of the idea of active resistance. The "atmospheric" influences of Scottish geography, topography and temperament, Lollardy, Lutheranism, and the Scottish middle-class movement are treated. The Biblical influence upon Knox is discussed in great detail. Knox relied heavily upon Old Testament precedents for his political theory. But he did not ignore the teaching of the New Testament. Knox was his own interpreter of scripture. He expected his interpretation to be accepted by all. He could make the Scriptures sanction revolution.

A great admirer of the ancient Hebrew Prophets, like Isaiah, Elijah and Jeremiah, the latter of whom he most heeded, Knox thought of himself as God's prophet to the sixteenth century. In his prophesying he made vivid the inevitability of God's vengeance upon idolaters [Roman Catholics] and proclaimed the political obligations of the nobility and people in resisting wicked rulers.

Of the personal and literary influences upon Knox's idea of resistance, the following are most carefully considered: John Major, George Wishart, Henry Balnaves' Treatise on Justification by Faith, Heinrich Bullinger, John Calvin, Christopher Goodman's How Superior Powers Ought to Be Obeyd, Theodore Beza, and the Magdeburg Bekenntnis. All of these may have figured in some measure in the formation of Knox's political ideas. The possible influences of George Buchanan, John Willock and John Ponet, while not crucially important, are included in the investigation.

The conclusions of the dissertation may be thus summarized: (1) Knox cannot be labeled a political theorist of specific type, e.g., "contract theorist." (2) "The thundering Scot" may have been partially shaped in political temperament and individuality by Scottish climate, geography and terrain. (3) Lollardy in Scotland doubtless gave Knox impetus in his career as a reformer. (4) Luther's teaching probably impelled Knox along the road to reform. (5) Scotland's rising middle-class assisted Knox in his reformation. (6) The most powerful and important influence upon the formation and development of Knox's political ideas was that of the Bible. (7) The influence of John Major upon Knox's political thinking was probably real, but the degree and specific content of his contribution cannot be ascertained. (8) Neither Knox nor George Buchanan contributed directly or significantly to the political thought of the other. (9) George Wishart probably imparted to Knox the reformer's earliest knowledge of Calvinism and a corresponding Continental statement on obedience. (10) Henry Balnaves' Treatise on Justification by Faith indicates Knox's affinity, in 1548, with the position of passive obedience. (11) No evidence can be cited which would indicate an interchange of political ideas between John Willock and John Knox. (12) Heinrich Bullinger, by the consultation of 1554, delayed Knox's conversion to the way of active resistance. (13) John Calvin, Knox's master and intimate associate, probably furnished his disciple with the hypothesis (Ephori) which led to revolution in Scotland. (14) John Ponet's Short Treatise probably had no effect upon the development of Knox's notion on resistance. (15) Knox's political writings in the summer of 1558 probably owed much to Christopher Goodman's How Superior Powers Ought to Be Obeyd. (16) Theodore Beza may have introduced Knox to the Magdeburg Bekenntnis. (17) The Magdeburg Bekenntnis supplied Knox in debate with contemporary support incidental and supplemental to his scriptural documentation.

Microfilm $3.20; Xerox $11.25. 247 pages.

LEWIS O. HARTMAN'S SOCIAL IDEALS

(Order No. 61-3742)

Joseph Reed Washington, Jr., Th.D.
Boston University School of Theology, 1961

Major Professor: Dean Walter G. Muelder

This study is limited to the social objectives of Lewis Oliver Hartman. He received the S.T.B. degree from Boston University in 1902, the Ph.D. degree in 1909. He was ordained in the Methodist Episcopal Church in 1903, serving his denomination as a pastor (1902-1910) and as an executive in the Board of Education (1910-1920). Dr. Hartman was editor of Zions Herald, the independent Methodist journal published as a weekly in Boston throughout his administration, from 1920 until his election as a bishop in 1944.

During his editorial career Dr. Hartman was known for his persistent support of human dignity and liberty and widely reputed as an independent thinker, particularly with regard to social issues.

The purpose of this study was to discover, set forth in the form of a reader, and reveal the source and meaning of Editor Hartman's social ideals.

The methodology of this work was the technique of content analysis. The criterion of the analysis was the Social Creed in its 1932 developed version. A variation of content analysis, the thematic Parallel Test as developed by Dr. Harold Lasswell and his associates, was the specific form: the known content in the communication channel of the Social Creed was compared with the content in Hartman's editorials.

13,454 editorials were written by Hartman. 2,427 of his editorials were analyzed, resulting in 3,344 exclusive statements consistent with and 69 contradictory to the Social Creed. These 3,344 consistent statements may be best understood within the following inclusive categories via the following exclusive frequencies: freedom—1,040; war-peace—578; justice-equal-rights—428; profit system—428; and prohibition-narcotics—408. This analysis of frequencies was broken down into exclusive categories and resulted in two dominant impressions: (a) Hartman was an apostle of human freedom, and (b) there was an unmistakable parallel between his social ideals and those of the Social Creed. This analysis has been incorporated as section III of this study.

An interpretation of the relevance and meaning of this analysis required the tracing of Hartman's situational responses by means of some philosophical and historical analysis, an endeavor to discover a pattern and its source. The philosophy of personalism, Barthian theology, and faith in the Kingdom of God were held in tension in Hartman's intellectual and spiritual outlook. He considered the institution of the church to be the responsible agent for constructive social action and reform. Hartman was primarily

a churchman and his three unique contributions to human well-being were shaped and expressed within Methodism: (a) Hartman was instrumental in the extension of autonomy to and the development of indigenous leadership within the Central Mission Conferences of Methodism, (b) Hartman's trip to Russia in 1923 resulted in his promotion of a fund to aid the program of Russian ecclesiastical education and support of the reform movement in Russian Orthodoxy, and (c) Hartman actively defended the moral rights of the American Negro throughout his editorial career—culminating in his opposition to the unification of Methodism which turned on the exclusion of Negroes from full participation in Methodism. Hartman later accepted the will of the majority and was elected to the office of bishop.

Section II of this study revealed Hartman's social ideals to follow from his ethical, theological premises. The Social Creed represents a social program. It is precisely this aspect of the Creed which distinguishes the purposes of its ideals from Hartman's purpose. He did not have a program. His social gospel was an extension of the personal gospel. Hartman's significance was his consistent action based on ethics and hope in the Kingdom of God.

Microfilm $5.90; Xerox $20.95. 462 pages.

JUSTIFICATION IN THE QUMRAN SCROLLS

(Order No. 61-3606)

James King West, Ph.D.
Vanderbilt University, 1961

Supervisors: Professor Lou H. Silberman
Professor Walter Harrelson

The purpose of this study is to explicate certain significant aspects of the character of man's justification before God as reflected explicitly and implicitly in the non-biblical Qumran texts (including the Damascus Document) that have been made available to date. The term "justification" is employed in the broad sense of all that which has to do with the rectification of evil and its consequences. All characteristic terms and presuppositions evident in the texts bearing on the basic problem of sin and guilt and its solution are considered.

The first chapter is devoted to a consideration of the presuppositions regarding man's nature with respect to his limitations and possibilities in relating to the divine demand for righteousness. One finds the human problem set within the context of an ontological, cosmological, moral, and self dualism which is qualified by an acute awareness of divine sovereignty and eschatological hope. In some of the texts attention is centered on evil persons and powers in whom wickedness possesses a dominant hold, and in other sources focus is on the guilt of the elect; but all the materials assume both aspects of the problem to some degree. The dualism is expressed in terms of a deterministic orientation whereby all men are viewed as belonging to one of the two "lots" of the elect or reprobate, although a degree of tension between the concepts of providence and responsibility is not lacking. The concept of sin as a result of the influence of divinely appointed demonic powers is balanced by the characteristically Hebraic understanding of evil as irresponsible transgression of God's Law. Nowhere is the dualism expressed in terms of a body-spirit or flesh-spirit dichotomy; no effort to attribute error to any one element within man's psycho-physical constitution (such as his "flesh" or "impulse") is ever evident. Man is responsible to God in the totality of his being.

The second chapter, entitled "Man Before God," is concerned with the nature and means of justification, including an examination of the character of the righteousness demanded of man, the soteriological vocabulary (the terms for "justification," "atonement," "purification," "repentance," "forgiveness," and "deliverance"), and the corporate dimensions of reconciliation. While the Law is assumed to be the tangible norm for the righteousness demanded of the covenanters, apparently none of the sources conceive of the possibility of righteousness or rectification of evil apart from the righteous character of God which is manifested in his benevolent action on man's behalf in establishing the right order of things. This understanding of God's justifying grace is not conceived apart from membership in the justified community. The latter is the true remnant of the elect nation constituted of the recipients of the original covenant in renewed form and the inheritors of the promise made for "the land."

In the third chapter the nature of God's victory in vindicating the faithful remnant and defeating the forces of evil is examined and related to the understanding of justice. In spite of a degree of "realized eschatology," the perspective of the covenanters is oriented to the future when they expected to share fully in the gifts of God's grace. Only through the decisive judgment of God, it was felt, could the right order be restored and the righteous character of God be revealed.

A final chapter summarizes the character of justification in the separate texts and in the sources as a whole and asseses the significance of the study for attempts at identifying the community and for increasing our understanding of justification in Judaism and the New Testament.

Microfilm $3.45; Xerox $12.15. 265 pages.

THE CHANGING ROLE OF THE TOWN AND COUNTRY CHURCH IN VERMONT

(Order No. 61-3743)

Charles Earnest Wilson, Jr., Th.D.
Boston University School of Theology, 1961

Major Professor: Dr. Herbert E. Stotts

The purpose of the dissertation is to examine the social, economic, and cultural changes in Vermont, determine the patterns of community life, describe the policy of the denominational administration of the churches, define the programs in the local churches, and to evaluate the town and country church in the light of the foregoing trends.

The study proceeded on five levels of inquiry: the state, community, denominational administration, local church, and leadership. The towns and churches were studied in these types: agricultural, college, commuter, industrial, mining, recreation-resort, retail center, and timber towns. The methods of research utilized were directed interviews, depth studies of selected towns and churches, regional

conferences of state leaders, questionnaires to all Protestant churches and ministers, and field observation.

A shift from a gemeinschaft to a gesellschaft way of life in both community and church was revealed by the research. Analyzed by town types, the churches reflected this shift in their programs and the ministerial leadership revealed variations in age, training, and status. The rate and degree of change varied according to type of community.

Conclusions regarding present church and community life are:

1. Extensive changes in Vermont's economy effect the population trends and movements.
2. Towns can be classified according to the inhabitants' source of income and occupation.
3. Local churches follow a classification which coincides with the types of towns, and church programs mirror the changes within the community.
4. The type of town influences the church program more than does the size of membership, denominational affiliation, or the enacted leadership.
5. The role of the church, revealed on a continuum with gemeinschaft and gesellschaft extremes, varies from town type to town type.
6. Denominational and church leaders determine their programs in response to rather than in expectation of change.
7. The churches studied are failing to serve low-income groups.
8. The ministers, having urbanized training, give urbanized leadership in a rural setting and institution.
9. Major problems of the minister result from the conflict of his urban way of life and the community's rural characteristics.
10. Urban churches ascribe a specialized role to the minister and rural churches ascribe a general role with variations according to town type.

Conclusions regarding the church strategy for the future are:

1. Denominational cooperation is a major need on all levels of church life.
2. Overchurching is a continuing problem to be met with a unified approach.
3. Pastoral responsibility should be more evenly distributed so that a minister serves a minimum of 300 constituents.
4. Financial support of the pastor should be increased.
5. Church programs should include services for the newcomer, young adult, the person over 65 years of age, and the low-income family.
6. The layman's role should be enhanced and his talents more fully utilized in church programs.
7. A reconstructed flexible program is mandatory if the church is to serve the community, and simply to augment or intensify the present program to meet the changing needs is inadequate.
8. The church council must recognize the dilemma its member denominations face: a moral imperative of total community service versus a tradition of selective status service.

Conclusions regarding town and country churches in general are:

1. Administrators can predict with reasonable degree of accuracy the future of some types of churches.
2. No program is completely suitable for town and country churches unless it is designed for a specific type of community.
3. Effective program planning must consider the type of church as well as the size and economy of the membership.
4. Seminary training should equip the minister to meet problems of conservative attitudes, sparse leadership, and local church failure to serve low-income families.
5. The denominations, church councils, and seminaries could utilize these findings to help church leaders understand and guide the changing role of the town and country churches.

Microfilm $4.05; Xerox $14.20. 313 pages.

AMBIGUITY AND RESPONSE CONFLICT: A CONCEPTUAL AND EXPERIMENTAL ANALYSIS.

(Order No. 61-3410)

Malcolm Ward Klein, Ph.D.
Boston University Graduate School, 1961

Major Professor: Robert Chin

This study tests the proposition that the speed of recognition of ambiguous visual stimuli can be predicted from propositions derived from behavioral conflict theory. A review of the literature indicates that no common, generally accepted conceptualization of the nature of ambiguity exists, and that confusion abounds due to the myriad purposes, definitions, and operations involved in previous studies involving ambiguous factors.

Several writers have suggested the similarity of ambiguous stimuli to conflict-arousing stimuli; and several conflict factors have been shown to affect response time. Among these are the number, relative strengths, and absolute strengths of competing response tendencies. Accordingly, it was hypothesized that time to final recognition of serially presented ambiguous stimuli would be a function of the number of response alternatives available, their relative probabilities of occurrence, and their absolute strengths. Number of alternatives were varied by allowing S's to choose between two or four alternatives. Probabilities were varied by associating 3 to 1, 1 to 3, and even odds with the alternatives. Two variations of absolute strengths were induced by reinforcing or not reinforcing correct alternatives over a series of four trials preceding the critical trial.

In addition, high and low authoritarian subjects were used to test the hypotheses that (a) high F subjects, because of their difficulty in handling conflict, would take longer to recognize the stimuli, and (b) that differences in authoritarianism would accentuate the other differences predicted. Form 40 - 45 of the F scale was used.

Subjects were Boston University summer students taking introductory social science courses. Half were volunteers and half took part as a class requirement. The ratio of men to women was 2 to 1, and the mean age was 21.9 years.

The subjects acted as their own controls. In each condition S saw a graduated series of fourteen 9" x 11" cards presented serially, in which the stimulus became progressively clearer. In each condition a different task was employed. Order of tasks, conditions, etc. was systematically varied. Each card in a series contained four images (e.g., church, key, candlestick, and flask) which could appear in one of two or one of four possible orders, according to the design. In addition, E assigned probabilities to each alternative order in order to test the relative strengths hypothesis. To test the absolute strengths hypotheses, the two-equal-probabilities alternatives condition was expanded to five trials, the first four of which served to reinforce or non-reinforce the response to be correct on the fifth and critical trial.

S registered a response on each card by flipping one of the switches before him corresponding to the available alternatives or a "no guess" alternative. The recording of the response was done by E. Several measures were taken in addition to card number of final decision (recognition) including card of first guess, card of first correct guess, and response time per card. These latter measures generally correlated significantly with final decision.

The major predictions were generally confirmed. A greater number of response alternatives yielded greater time to decision. An increase in absolute strengths of alternatives yielded greater time to decision among high, but not among low authoritarians. Alternatives with higher associated probabilities were correctly identified earlier than those with lower probabilities, but only when the verbal induction was followed by a trial in which the more probable alternative was correct (thus reinforcing the instructions which by themselves were not effective).

The authoritarianism hypotheses were not generally confirmed, with the exception of the interaction with absolute strengths, as noted above. Several possible explanations for this failure in hypothesis confirmation are offered. Microfilm $2.75; Xerox $5.40. 110 pages.

HUMOR JUDGMENTS AS A FUNCTION OF REFERENCE GROUPS: AN EXPERIMENTAL STUDY.

(Order No. 61-4500)

Lawrence La Fave, Ph.D.
The University of Oklahoma, 1961

Major Professor: Muzafer Sherif

While a study by Roberts and Johnson (following Freud and Mead) suggests that humor and empathy (identification) are directly related, other experiments indicate an inverse function. The present study, following Hobbes' "superiority theory" of humor, resolves these contradictory findings by showing that results depend upon what happens to the object of identification.

Major hypothesis (HIG): Jokes tend to be judged funny by Ss whose reference group is esteemed, and whose outgroup is disparaged, and to be judged unfunny by Ss whose reference group is disparaged and whose outgroup is esteemed. Subhypotheses: (H1a) Jokes which esteem Ss' reference group tend to be judged as funny. (H1b): Jokes which disparage Ss' reference group tend to be judged as unfunny.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. **Please order copies by number.**

Four experimental groups of over 50 Ss each (Catholics, Jehovah's Witnesses, Southern Baptists, and agnostics), total = 209, were asked to sort 20 "religious" jokes into five degrees of funniness. Each S was chosen only if both a participant observer and S himself indicated the appropriate one of these four groups as S's reference group.

The sixteen jokes involved dialogue between two of the religious groups, while four other jokes contained dialogue between Christians and agnostics. (Christians were considered a "supergroup," since all Ss in the three religious groups also identified themselves as Christians.) By a built-in experimental control, each joke which esteemed one group and disparaged another was counter-balanced by a joke which did the opposite.

A sign test substantiated predictions as follows: All 20 jokes were judged in the manner predicted, thus altogether confirming HIG. H1a was significant at the .04 level, and H1b at .02. When the jokes caused Ss to identify at a "supergroup" level, the major hypothesis was again perfectly substantiated ($p < .00025$)---supporting a new construct, concentric-circle-levels-of-identification. This new construct is largely based upon the concept of reference group, in the sense in which Sherif uses it--i.e., identification group. The new concept represents an attempt to refine such logic as involved in the reference-group concept further, so that intergroup and intragroup rivalries can be systematically varied in judgmental experimentation.

Microfilm $2.75; Xerox $4.60. 87 pages.

AN INVESTIGATION OF DEFENSIVE REACTIONS TO SHAME

(Order No. 61-3531)

Donald Kenneth Lauer, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dr. Albert Pepitone

A review of the literature discloses two different types of reaction to guilt or shame: a reaction in which the individual changes the consequences of the deviation which produced the guilt or shame by behaving in a manner opposite to the deviant behavior (cf. Freudian reaction-formation), or else "compulsive deviation" which may consist of a denial of the deviance of the act. It is proposed that these reactions are determined by the reversibility or irreversibility of the original deviant behavior. The following hypotheses are to be tested:

1. The greater the guilt-shame anxiety, the greater the reaction.
2. When the deviation is irreversible, the greater the guilt-shame anxiety, the greater the denial of the deviance. Basically, these hypotheses predict an interaction between reversibility and degree of shame.

Subjects appearing for a choice experiment are given a personality "test" as part of supposedly independent study. On the basis of this "test," half of the Ss are led to believe that they are extremely selfish, while the other half of the Ss are led to believe that they are no more selfish than the average person. Half of each of these groups are, in addition, led to believe that their selfishness is reversible--i.e., that they could change themselves if they choose to. The other half are led to believe that their selfishness if irreversible--i.e., that they could not change themselves even if they want to. These instructions are designed to produce reversible selfishness and irreversible selfishness. Following this, the Ss take part in an interpersonal situation in which they can choose to be cooperative or competitive. This situation provides a behavioral measure of reaction to the shame anxiety. Finally, the Ss fill out a self-evaluation questionnaire.

The results show that under the reversible condition, the shamed Ss cooperate on 15 percent more trials than do the non-shamed Ss. The results also show that under the irreversible condition the shamed Ss cooperate on 12.3 percent fewer trials than do the non-shamed Ss. This interaction is significant at the .001 level of confidence. Finally, the data show that subsequent to the interpersonal situation, the Ss do not differ significantly in self-evaluation. These results confirm the hypotheses.

Microfilm $2.75; Xerox $3.00. 29 pages.

SOME RELATIONSHIPS BETWEEN SOCIAL CONFORMITY AND SELF PERCEPTION

(Order No. 61-3720)

Albert R. Maslow, Ph.D.
The American University, 1961

Supervisor: Dr. Ellis Weitzman

The study was undertaken in an effort to clarify some of the motivating factors involved in conformity. It was postulated that low self-esteem is reflected in a lack of trust in one's ability to know reality and a need to validate perceptions by consensus. Following Deutsch and Gerard's distinction between "informational" vs. "normative" social influence, it was hypothesized that there is a relationship between low self-esteem and low discrepancy (informational) conformity. It was further hypothesized that the relationship between low self-esteem and conformity is less in high discrepancy (normative) yielding than in low discrepancy yielding. Presumably, consensual validation is important to the person with low self-esteem in that it serves as a means of "proving" his adequacy. From this it was hypothesized that there is a greater conformity – low self-esteem relationship when the set involved is that the task reflects general adequacy as apposed to the set of no relationship to abilities.

The subjects (316 fifth and sixth grade boys) were seen in groups of eight and were required to choose the longer of two lines in a series of cards. They made two judgments on slips of paper, one before and one after hearing the experimenter's false report of the group vote. Each card was shown for three seconds and was rotated 90° from the first to the second presentation. The amount of conformity was the percent of times each subject changed his initial vote from a veridically correct one to an

incorrect one following the announced bogus vote. The population was divided into four groups according to the four experimental conditions. In two of the groups, the difference in length between the paired lines was barely perceptible. These were "low discrepancy" groups. The other two groups were shown lines that were obviously different in length. These were "high discrepancy" groups. Within each of these divisions, one group of subjects received a preliminary suggestion that performance was a reflection of general abilities while the other group was told that it was not related to abilities. All subjects were given the Coopersmith Self Esteem Inventory (SEI) following the line judging experiment. In addition, each subject was rated on the Coopersmith Behavior Rating Form (BRF) by his homeroom teacher.

First, a product-moment correlation was calculated between the two self-esteem measures, yielding an r of .34. Pearson r's were then calculated between conformity and the SEI and between conformity and the BRF for each of the four groups. The only significant correlation was between conformity and the SEI in the low discrepancy group with the set of no relationship to general abilities. The coefficient was -.26, which is in the predicted direction and is significant at the .05 level of confidence. Since this was the only one of eight calculated correlations which was significant at the .05 level, it seems likely that it actually represents a chance variation.

A Defensiveness score (SEI-BRF) was also calculated as an indication of a tendency to over-rate oneself. Defensiveness was then correlated with conformity for all four groups. There were no significant correlations.

The evidence suggests that the relationship between conformity and low self-esteem, which has been consistently found with adults, is not present in preadolescent boys. Furthermore, the relationship appears to be absent in this population whether the conformity situation is normative or informational in orientation or whether or not the task is defined as a reflection of general abilities.

A more definitive testing of the hypotheses will require that the experiment be conducted with other age groups. Microfilm $2.75; Xerox $4.80. 93 pages.

A STUDY OF THE RELATIONSHIP BETWEEN PERSONAL INFORMATION AND SOCIAL SKILLS RATING

(Order No. 61-3852)

Windle Delmar Reel, Ed.D.
The University of Nebraska Teachers College, 1961

Adviser: William E. Hall, Ph.D.

The purpose of this investigation was to study the relationship that might exist between factual knowledge known about people and the ratings received by these people on the Friendship Rating Scale. The Friendship Rating Scale, a sociometric-like technique devised at the University of Nebraska to measure social skills among students, had been successfully used for a decade. It was desired, however, to know more about the theoretical basis for its functioning.

The Interpersonal Acquaintance Assessment was designed to gather factual information from the participants in the research; it required a subject to give data concerning the other members' birthday, father's occupation, steady date, summer plans, and cumulative grade average. A subject's general knowledge about the other members could be inferred from his success in supplying accurate information on the five-item questionnaire. Each subject's position was estimated, both on the basis of what he knew about the others and what the others knew about him.

The scale and the questionnaire were administered to the members of a fraternity and a sorority on the university campus; this involved 43 men and 46 women.

Statistical analysis of the data supported, in some respects, the originally hypothesized contention of a relationship between Friendship Rating Scale position and factual knowledge.

Subsidiary investigations peripheral to the main consideration disclosed some additional information. One such indicated that there was no statistically significant correlation between a subject's Friendship Rating Scale position and his L- and Q-score from the ACE Psychological Examination. A second finding was that men who were high on the Friendship Rating Scale tended to achieve higher college grades. In this same respect, the data for women failed to attain statistical significance. A third item of interest indicated that those women who possessed a relatively high amount of factual information about others tended to rate these same people higher on the Friendship Rating Scale than did the total group.

Microfilm $2.75; Xerox $6.00. 125 pages.

A STUDY OF LUMP SUM SETTLEMENTS AND REHABILITATION UNDER THE MASSACHUSETTS WORKMEN'S COMPENSATION ACT

(Order No. 61-3836)

Dorothy Milgram Singer, Ed.D.
Boston University School of Education, 1961

Statement of the Problem

The purpose of this study was to investigate the attitudes towards lump sum settlements and rehabilitation of those persons who may advise or recommend a lump sum settlement for an injured worker and to indicate the possible effect of a lump sum settlement upon the vocational rehabilitation of an injured worker.

Summary of Procedure

Two groups were selected. Group I, consisting of twenty-four persons who may advise or recommend a settlement, included compensation attorneys, insurance representatives, physicians, and commissioners of the Industrial Accident Board. Group II was comprised of thirty injured workers with uncontested claims who received a lump sum settlement. A questionnaire was designed for each group. The members of Group I were interviewed in their offices and those in Group II were interviewed in their homes four to six months following the settlement.

Findings

Group I.

1. Less than ten per cent of the respondents considered an injured worker's need for vocational rehabilitation services before closing a compensation claim.
2. Almost 60 per cent of the respondents stated they were unfamiliar with the purposes and/or function of the Rehabilitation Commission. Approximately 42 per cent did not believe it was their responsibility to discuss vocational rehabilitation with the injured worker and there was no agreement concerning which group (attorneys, insurers, physicians, commissioners) had the responsibility for referring injured workers for evaluation for rehabilitation services.
3. The insurers were opposed to the statutes which require they pay for vocational rehabilitation. Although insurers are required by law to refer injured workers to the Rehabilitation Board after six months, they do not necessarily adhere to this regulation.
4. The attorneys criticized the present rehabilitation programs, some stating that the large insurance-sponsored rehabilitation center is only a "token program for advertising purposes."
5. The medical directors of the rehabilitation programs stated that lump sum settlements interfere with the rehabilitation process because the attorneys pressure their clients to exaggerate a disability in order to enhance the value of the claim.

Group II.

1. Over forty-six per cent of the workers were unemployed. Sixty-three per cent of the employed workers returned to employment before settling the claim.
2. None of the injured workers received any vocational rehabilitation services.
3. Only one worker knew of the Massachusetts Rehabilitation Commission and none had heard of the Special Placement Services of the Division of Employment Security.
4. The majority of the injured workers stated the insurers had mistreated them and, in some instances, deprived them of their rights.
5. The majority of the injured workers used the settlement to pay their debts. Only one settlement was possibly used for vocational rehabilitation purposes.

Conclusions

Group I

1. The present system of referring injured workers for rehabilitation services by persons who are not oriented to the rehabilitation needs of injured workers and who have a financial interest in the claim does not insure proper rehabilitative measures for injured workers.
2. The fact that referrals to the Rehabilitation Board are not legally required until six months after the injury means that the crucial period following an injury is completely unsupervised.
3. Antagonisms between the persons within Group I sometimes appeared to supersede concern for the injured worker.

Group II

1. A lump sum settlement does not "rehabilitate" an injured worker.
2. Injured workers need the support and assistance of a vocational counselor following an industrial accident. They are unaware of the agencies which might offer them vocational rehabilitation services.
3. The injured workers with families feel forced to take a settlement because of the inadequacy of compensation payments while they are unemployed.
4. Injured workers have been oriented to think primarily in terms of a settlement to recover their salary losses and not of rehabilitation services which might restore them to gainful employment.

Microfilm $2.75; Xerox $8.60. 190 pages.

AN ANALYSIS OF THE SOCIAL DIFFUSION OF AN AUDIO-VISUAL MESSAGE THROUGH A CHURCH CONGREGATION

(Order No. 61-3227)

Theron Edwin Swank, Ed.D.
Indiana University, 1961

Chairman: Carolyn Guss

Statement of problem. The analysis of selected aspects of the diffusion of information through the interpersonal communication networks of a church congregation. The major sub-problems were:

(1) To locate isolates (nonknowers) who did not receive the selected message and on the basis of selected variables compare these isolates with those congregational members who became knowers of the message through the channels of social diffusion.

(2) To locate those communication network members who performed a communicator's role and on the basis of selected variables compare these communicators with noncommunicating network members.

(3) To locate and describe on the basis of selected variables the communicator-communicatee relationship found in the interpersonal communication networks activated in the process of transmitting the selected message.

Source of data. A sound-filmstrip message about specific church problems was presented on a Thursday evening to 30 Official Board members of the First Christian Church in Waukegan, Illinois. The period extending through the following Sunday was allowed for the diffusion of the message to other members of the congregation. During the following Monday through Thursday, 283 members of the 583-member congregation were interviewed to collect message diffusion data.

Findings. Message knowing was positively correlated with high interest, friendship, and attendance records.

Knowing was lowest among the very young adult and elderly adult groups, but was highest among the two middle adult groups. Both the very young and the elderly adults tended to have fewer friendships than other adults. While knowing was found to be positively correlated with higher educational level, no correlation was established between knowing and sex or family size.

The communicator's role was positively correlated with a very high interest in church affairs, but not with friendships or church attendance. With the exception of educational level, the demographic variables of age, sex, and family size were not correlated with communicating. Knowers who learned the message from sources outside their own family more frequently acted in a communicator's role than did those knowers who learned it from a member of their own family.

Interaction was largely between family members or friends and occasionally acquaintances. There was virtually no interaction between relatives. During the diffusion period, the characteristics of the interaction changed from an intra-family to an inter-family relationship. Communication tended to flow from knowers with high interest, friendship, and attendance scores to members having lower interest, friendship and attendance scores. Interaction between different sexes, ages and family sizes was shown to be influenced by the social setting of the interaction.

Conclusions. Friendships and shared interests were significantly related to diffusion level. Their presence did not insure knowing, but their absence was a block to knowing. Demographic variables served to identify groups, but friendships and shared interest served to explain communications within these groups.

Both a very high interest level and communicative opportunity were significantly related to communicative activity. Friendships served as social channels directing the diffusion flow, but they were not significantly related to the decision to communicate.

Interaction was largely between persons united by close personal bonds--family members and friends. Interaction between nonfamily members tended to stimulate further interaction more frequently than did interaction between family members. The decline of communication activity may have been influenced by interaction flowing from the communicator with the larger group of friendships, greater interest and high church attendance to the communicatee who scored lower on these factors.

Microfilm $2.75; Xerox $9.70. 211 pages.

AN INVESTIGATION OF THE INFLUENCE OF GROUP STANDARDS AND DEVIATE MEMBER BEHAVIOR ON THE EXHIBITED RACIAL PREJUDICE OF AN INDIVIDUAL

(Order No. 61-3725)

John George Tiedemann, Ph.D.
The American University, 1961

An investigation was undertaken to determine if the biased behavior of a majority of a group's members and/or the behavior of a deviate group member would influence an individual to exhibit pro- or anti-white or Negro behavior in a given situation. Sixty-five white, adult, male subjects, thirty-five of whom were non-prejudiced and thirty of whom were significantly prejudiced pro-white and anti-Negro, were studied in thirteen different artificial group situations. In each situation, the confederate group members conducted their behavior in a pre-determined fashion to confront the subject with various combinations of pro- and anti-white and Negro attitudes. The behavior of the group members and the subject in each situation centered about the task of estimating the intelligence of ten white and ten Negro adult males from their photographs.

The following table summarizes the implications of the study:

When the group standard was:	The influence on non-prej. Ss. produced:	The influence on p-w and a-N prej. Ss. produced:
Neutral	No sig. change in exib. prej.	No sig. change in exib. prej.
Unanimously p-w & a-N	A sig. change toward exib. more p-w & a-N prej.	
Unanimously p-N & a-w	A sig. change toward exib. more p-N & a-w prej.	A sig. change toward exib. more p-N & a-w prej.
Neutral & 1 group member was p-w & a-N	A sig. change toward exib. more p-w & a-N prej.	No sig. change in exib. prej.
Neutral & 1 group member was p-N & a-w	No sig. change in exib. prej.	A sig. change toward exib. more p-w prej. only
p-w & a-N, & 1 group member was a-w & p-N	A sig. change toward exib. more p-w & a-N prej.	A sig. change toward exib. more p-w & a-N prej.
p-N & a-w, & 1 group member was a-N & p-w	A sig. change toward exib. more p-N prej. only	A sig. change toward exib. more p-N & a-w prej.

Note: p-w denotes pro-white and a-N denotes anti-Negro
p-N denotes pro-Negro and a-w denotes anti-white

Some conditions under which the behaviors of the group majority members and of the deviate group member are believed to have more (or less) influence on an individual's overt prejudicial behavior were presented, along with a theoretical frame discussing the use of group conditions as a factor in controlling the exhibition of prejudice.

Microfilm $3.50; Xerox $12.15. 269 pages.

SOCIAL INFLUENCE TOWARD UNANIMOUS GROUP DECISION IN VARIOUS GROUP AUTHORITY STRUCTURES

(Order No. Mic 61-2808)

Donald McCreery Wolfe, Ph.D.
University of Michigan, 1961

The research here reported is directed to the following problems: Under what conditions and through what processes do the members of a group select a single course of group action from among a number of potential alternatives? How are various individual preferences amalgamated into a group choice? In contrast to several formal approaches to this problem, the present research deals directly with social interaction and influence, factors often involved in preference change for the individual members. To a large extent, the group's power structure circumscribes these processes.

In this study, formal authority relationships among the members of 49 four-person groups were varied experimentally, producing differentiated power structures. The task called for the group to select, by unanimous vote, a single course of group action from among four alternatives which represented potential solutions to a hypothetical problem. Measures were taken of personal preferences for the alternatives both before and after a ten-minute discussion period. Records of interaction and influence behavior were kept by the subjects, and a post-experimental questionnaire provided measures of several other variables including various other types of interpersonal relationships.

Part II deals with the theory of social power and influence in the dyad. The power of an influencer O over an influencee P is defined as the ability of O to perform acts which induce forces on P toward changes in P's opinions or behavior. Three sources of O's power were identified —O's formal authority over P, P's attraction to O, and P's respect for O's expertness. The strength of O's efforts to influence P was found to be a multiple function of the magnitude of power of O over P and the degree of disagreement between P and O. Preference change for P was found to be an increasing function of the strength of O's influence efforts and of the magnitude of power of O over P.

In Part III a social psychological theory of group decision-making is developed, patterned after French's formal theory of social power and dealing with the problem of individual preference change in a group-decision situation. The force induced by O on P toward change in evaluation of an alternative a_i is seen as a multiple function of the discrepancy between P's and O's evaluations of a_i and the power of O over P. This provides a basis for predicting changes in personal preference and, from this, for predicting eventual group choice.

The following conclusions received strong empirical support: (1) the greater the magnitude of resultant force toward change in evaluation of an alternative, the greater the change in evaluation, (2) P will change his preference from alternative a_i to a_j if the resultant forces on those two alternatives result in an increase in evaluation of a_j plus a decrease in evaluation of a_i greater than the discrepancy between his initial evaluations of the two, (3) a group will attain a unanimous agreement of personal preferences if the resultant forces (as measured by their determinants, discrepancy times power) on all members produce preferences for a single alternative, (4) the group will choose by unanimous vote that alternative, if any, which is expected to be preferred by at least a majority of the members (where expected preference is based on resultant forces on the alternatives), (5) the group will choose by unanimous vote that alternative which is expected to be evaluated highest on the average as a result of social influence, and (6) decision-time is a decreasing function of the degree of agreement among the members prior to discussion.

Microfilm $3.20; Xerox $11.25. 246 pages.

SOCIOLOGY

SOCIOLOGY, GENERAL

DECISION-MAKING IN DAIRY FARMING: A SOCIOLOGICAL ANALYSIS.

(Order No. 61-3675)

Ronald George Klietsch, Ph.D.
University of Minnesota, 1961

Statement of Problems:

A sociological theoretical frame of reference for the analysis of decision-making is developed from an integration of social action postulates and game theory and applied to the rejection or acceptance of a recommended innovation among dairy operators. Three research questions are posed:

1. Can self-stated acceptors and rejectors of the dairy practice be differentiated on the basis of selected independent variables and, if so, which variables are associated with acceptance and rejection?
2. Can operationalized strategies of decision-making be employed to explain and predict the outcomes of decision-making?
3. On the basis of obtained categories of acceptors and rejectors derived from common usage of different individual strategies of decision-making, can further refined identification be made of acceptor and rejector types on the basis of certain selected independent variables?

Methods and Procedures:

A centralized interviewing technique was employed to secure data from a stratified random sample of one-hundred and ninety-five dairy operators of a single Minnesota county. Statistical analysis was performed upon twenty-six variables to assess significant differences between acceptors and rejectors. Employing theoretical formulations of Max Weber, Talcott Parsons, John von Neumann and Oskar Morgenstern, operationalized strategies of decision-making were developed. These strategies examine various decision-making types, formulated as the traditionalist, rationalist, evaluator, and affector acceptor and rejector. Subsequently, relative to hypothesized forms of strategies, observed individual strategies of decision-making were tested for degree of reproducibility of expected strategy models. Thereafter, categorization and identification were made of individuals employing similar strategies. Terminal statistical analysis of hypothesized null relations on selected variables among acceptor and rejector categories (types), as well as between identical acceptor and rejector categories, was performed to develop straightforward refined identification of strategies of decision-making.

Results:

1. Self-stated acceptors and rejectors are differentiated significantly on a series of variables.
2. Acceptors and rejectors differ significantly in their approaches to solving decision-making situations.
3. Hypothesized strategies of decision-making yield 80 percent predictive accuracy of outcome among acceptance models, with somewhat lesser predictive efficiency for rejection models.
4. Acceptor and rejector types, as derived through categorization on the basis of individual strategy employed in decision-making, are differentiated on certain variables. Furthermore, the combination of differentiating variables within and between categories yields a refined profile of four rejector and four acceptor types.

Conclusions:

1. Differentiation of self-stated acceptors and rejectors on selected variables yields definite complex sets of distinctions between the groups.
2. Decision-making models employed in this research improve both explanation of the process of decision-making and prediction of outcome over random assignment of outcome. The concept of fixed and operationalized points in decision-making models facilitates decision-making prediction.
3. Straightforward identification of acceptor and rejector types is achieved and improved through the use of distinctions obtained on the selected independent variables, within the limits of predictability established by categorization of decision-making types.

Microfilm $2.75; Xerox $8.80. 191 pages.

SOCIOLOGY OF CONVERSION: SOCIOLOGICAL IMPLICATIONS OF RELIGIOUS CONVERSION TO CHRISTIANITY IN KOREA.

(Order No. Mic 61-1572)

Rev. Gabriel Gab-Soo Lee, Ph.D.
Fordham University, 1961

Mentor: Joseph P. Fitzpatrick, Ph.D.

Sociology of Conversion is a study of sociological factors affecting the change of religious belief and practice. More specifically it is the study of the relationship between the sociological factors and the religious conversion to Christianity in Korea.

The phenomenon which provoked this investigation was the historical experience of an unusual conversion movement to Christianity in Korea during three periods; an early Catholic conversion movement from 1784 to 1884; the introduction of Protestantism and the conversion movement to Protestantism from 1884 to 1935, and both Catholic and Protestant conversion movements from 1945 to the present. The author's familiarity with the country, his access to available factual data of a general kind, and the scarcity of sociological research on conversion movements to Christianity were promising factors in the study. Lack of specific statistical data was a handicap.

The historical facts of conversion movements during these three periods raised the question whether there were sociological factors directly related to religious conversion to Christianity in Korea. This thesis is an attempt to investigate and if possible, to identify these sociological factors.

The study of the first period indicated that the social situation was characterized by what Durkheim called anomie (a normless social condition which results in social and personal disorganization and demoralization). This led to the hypothesis that a positive relationship exists between religious conversion and a social situation of anomie, i.e., that conversion to Catholicism was apparently a positive reaction to the social situation of anomie.

In order to test this hypothesis a careful analysis was made of Durkheim's concept of anomie. Durkheim had elaborated this concept in his studies of suicide. He had concluded that noticeable increases in rates of suicide were related to the social condition of anomie, and he identified the characteristics of the people who seemed most likely to react to anomie by committing suicide. In the present study an analysis was made of the Korean converts according to these same characteristics. The analysis supported the hypothesis that there is a relationship between social anomie and religious conversion.

Taking this as a tentative hypothesis, the study was extended to the second and third periods of the conversion movement. Examination of the social situation of both periods again indicated an anomic condition similar to that of the first period.

However, it was evident that the social condition of anomie alone was not an adequate sociological explanation of the phenomenon of religious conversion. Further examination of the data indicated that there were other factors

which in combination with social anomie brought about the actual conversion. These are the religious inadequacy of the native belief and of the alien religions of Buddhism and Confucianism; the contact of the people with Christian missionaries and freedom to embrace Christianity; the awakening awareness of Korea's place in the family of nations; and the high evaluation of western civilization with its religious background of Christianity.

This led to the final conclusion that social anomie brings about positive, as well as negative reactions; that it can be a general condition favorable to religious conversion as well as a general condition provoking suicide. According to the particular circumstances of Korea, the reaction to social anomie was reflected more significantly in the positive form of religious conversion to Christianity rather than in negative forms of social behavior.

Microfilm $3.95; Xerox $13.95. 308 pages.

THE SOCIAL DEBT: AN INVESTIGATION OF LOWER-CLASS AND MIDDLE-CLASS NORMS OF SOCIAL OBLIGATION IN LOUISVILLE, KENTUCKY.

(Order No. 61-3599)

Donal Ewart Muir, Ph.D.
Vanderbilt University, 1961

Supervisor: Eugene A. Weinstein

Georg Simmel suggested that in the metropolis "the multiplicity and concentration of economic exchange gives an importance to the means of exchange which the scantiness of rural commerce would not have allowed." As a consequence, metropolitan man tends to rationally reduce all quality and individuality to an exchange value "often even with persons with whom he is obliged to have social intercourse."

In Western Society the roles attached to the positions of debtor and creditor have been rather clearly delineated in the sphere of economics. Simmel's work suggests that the analogous positions of social debtor and creditor may exist in the sphere of sociable interaction. Should these positions exist it seems likely that they would be of analogous importance in the understanding of that interaction. Social behavior may be explained, to an extent largely unsuspected, by the occupancy or desire to occupy (or avoid) the positions of social debtor and social creditor. The purpose of this study was to empirically investigate the specific roles attached to these positions.

A "social service" was defined as any voluntary performance of assistance bestowed without explicit requirement of repayment (e.g., a "favor"). Whenever a person perceives himself as being obligated to another for such a service he is termed a "social debtor." This other, of course, becomes his "social creditor."

Fifteen hypotheses concerning the roles of social debtors and creditors were stated. These hypotheses were based upon incidents reported by Peter M. Blau, William F. Whyte, and others, as well as upon the experiences of the author and his associates. In addition, following Simmel, the norms governing economic exchanges in our society were carefully examined for leads.

An interview schedule was designed to gather the data for tests of these hypotheses. This instrument was, largely, divided into two sections; (1) an "intensive interview" in which respondents were directly asked to report their behavior and feelings concerning "favors" and "social obligations," and (2) a "situational interview" in which subjects were asked to predict the behavior of characters in a series of "typical" situations involving social exchanges.

The sample consisted of one-hundred-twenty white female residents of the Standard Metropolitan Area of Louisville, Kentucky. Sixty of these respondents were randomly selected from census tracts classified as lower socio-economic-stratum tracts, while a second sixty were drawn from upper-middle socio-economic tracts. A comparison of the normative structures of these two major socio-economic strata was thus possible. Females were picked as respondents because their home-centered activity traditionally includes acting as "social secretary."

Respondents from both areas seemed to account social obligations, felt that obligations should be voluntarily repaid where possible, and disapproved of debtors who did not do so. Simmel's thesis was thus lent empirical support. In general the findings suggested that high-SES subjects conducted their social interaction in a business-like manner while low-SES subjects, although conscious of social obligations, were relatively reluctant to allow them to influence the pattern of future exchanges. This low-SES pattern might be termed "modified altruism" in that one gives when able, expecting others to do the same. This result is compatible with the concept of "mutual aid" ascribed to the lower classes. In the sense that members of the lower class tend to be recruited from rural areas and are consequently in the process of assimilating to the urban culture, these differences by socio-economic level serve to add additional support to Simmel's view.

Microfilm $2.75; Xerox $9.25. 205 pages.

BASES OF PRESTIGE AMONG HIGH AND LOW DELINQUENT STREET-CORNER GROUPS

(Order No. 61-3382)

Bertram Spiller, Ph.D.
Boston University Graduate School, 1961

Major Professor: Albert Morris

In order to determine differential bases of prestige, this study compared two age segments of a highly delinquent street-corner group with two corresponding age segments of a moderately delinquent street-corner group. The corresponding age segments were matched for age, ethnicity, and religion. There were 116 boys in all.

The data were obtained from the process records of "detached social workers" who observed the groups for periods averaging 18 months. These field data were subjected to a standardized content analysis system formulated within the cultural anthropological framework. A 19 per cent random sample of prestige-oriented acts from this universe constituted the study population.

IBM procedure was utilized to obtain tabulations of

interaction with reference to cultural practices (drinking, fighting), sports and club activities, and worker functions. Cultural practices and sports-club activities were classified into those reflecting lower class, middle class, and adolescent behavior. This was supplemented by scanning the qualitative data.

The findings showed that high delinquency was associated with lower social class, lack of father figures, high commitment to lower class behavior, and low involvement in age-linked adolescent activities. There was a noticeable lack of concern with middle class behavior. Conversely, moderate delinquency was related to somewhat higher social class, presence of father figures, less involvement in lower class behavior, and high commitment to adolescent behavior. This group also showed a negligible involvement in middle class behavior.

Analysis showed that frequency and intensity of interaction determined the selection of prestige targets. The groups were most involved with their own In-Group. The Worker was ranked second but only after he had accepted their lower class position. Other targets were less important.

The more delinquent groups were found to be more cohesive and solidary. They were able to give and take strong emotional outbursts of hostility without disrupting group consciousness. The less delinquent groups engaged in more frequent but less intense outbursts of hostility.

It was concluded that the primary functions of the street-corner groups were to provide masculine sex-role models and generalized training for adult occupational roles. Each group had a set of well-established standards and patterns of behavior regarding accepted masculine behavior. The more delinquent groups supported more law-violating behavior while the less delinquent groups supported athletic skill as indices of masculinity.

The most delinquent group provided training for adult criminality and the "classic" lower class adult role; the less delinquent groups provided models for the law-abiding lower class adult role. Those who adhered to the "classic" lower class role gave high priority to regular weekend drinking with bar cronies, supported voluntary unemployment, got into "trouble," and gave low priority to home and familial responsibilities. Adherents of the law-abiding lower class position gave high priority to steady employment, drank moderately, avoided "trouble," and gave higher priority to home and familial responsibilities.

It was apparent from the data that differential group functions reflected differential social organization and acculturation. The functions performed by the groups were related to aspects of lower class subculture. The greater involvement in lower class culture, by the more delinquent groups, indicated that the etiology of delinquency can be better understood by further investigating that subculture.

Microfilm $2.90; Xerox $10.15. 222 pages.

PATTERNS OF INTERACTION: THE SIGNIFICANCE OF NUMBERS ON TOGETHERNESS.

(Order No. 61-3689)

Samuel Eugene Wallace, Ph.D.
University of Minnesota, 1961

Data were collected on 500 subjects' interaction with a maximum of nineteen neighbors, three relatives, three co-workers, and three recreational friends. These subjects resided in twenty-five arbitrarily selected neighborhoods of the urban area of San Juan, Puerto Rico.

Review of the literature revealed two contradictory theories of social interaction. Lundberg and Steele, Bales, Dawe, and others state that the intensity of interaction decreases per unit increase in size. Satisfaction, social activities, intimacy, inhibition, and the per cent participating in the discussion decreases as the number of persons involved increases. Caplow and Forman, Mayo and Barnett, Christensen, and others argue the reverse. Their data indicate a positive relation between group size and international intensity.

Theoretical synthesis was offered in the form of a limit theory of social interaction. This formulation stated that extensity and intensity of interaction were positively related to some limit in group size – after which they were negatively related.

Comparison of the extensity and intensity of interaction supported the concept of a limit. That is, the average intensity of interaction increased as extensity increased until interaction with fifteen persons was reached. At this point, interactional intensity decreased.

Increasing the size of the group does change the character and structure of the relationships between members. The average intensity of all interactive pair relationships increases as the size of the group expands. Dyads are almost always composed of two intimates. Triads are typically composed of two intimates and a non-intimate. Groups with from four to eight members have a common interaction pattern well differentiated from both smaller and larger groups. In groups larger than eight members, a drop in average intensity occurs. The rate of interaction remains fairly stable from groups of nine to fifteen members. After this limit is passed, extensity and intensity become negatively related.

Each person added to the group increases the number of potential pair relationships in the order of triangular numbers. This does not effect the number of maintained relationships below a group size of twenty persons. It does, however, effect the intensity at which these relationships are maintained. As the number of pair relationships increases, the average intensity of interaction decreases. Intimacy between all members of a group decreases as the size of the group increases.

The pattern of interaction for an individual in one group is found to be unrelated to his interaction in another group. High interaction with neighbors does not influence the pattern of interaction among relatives, co-workers, or recreational friends. The inverse relationship between the number of neighbors and recreational friends is the single exception.

All the findings demonstrate the total inadequacy of the theory based on an inverse relationship between extensity and intensity. The synthesis of a limit theory was found to

be adequate for relations within ambiences. The subjects were found to have intimate, close relationships in all ambiences. It is only with respect to the total number of people involved that extensity and intensity are negatively related. Microfilm $2.95; Xerox $10.35. 227 pages.

CONTINUITIES AND DISCONTINUITIES IN DENOMINATIONAL LOYALTY: A LEHIGH VALLEY STUDY OF RESIDENTIAL MOVEMENT AND CHURCH MEMBERSHIP.

(Order No. 61-3572)

William Ward, Ph.D.
University of Pennsylvania, 1961

Supervisor: Dorothy Swaine Thomas

Statement of Problem

There is little authoritative information concerning reasons for choices persons who change residence make about continuity of church membership and participation. When the phenomenon has been studied, the typical procedure has been to seek information from church officials, and the unit of study has been the congregation or the denomination. This dissertation is a response to a need for studies based on replies from the individuals who move and make decisions about membership continuity.

Procedure and Methods

A systematic sample of 225 households was drawn from the 1955 Bethlehem, Pa., City Directory, and within the 13th Ward of the city. The ward was chosen because it housed life-long residents as well as persons who entered with successive waves of in-migrants to occupy new housing built toward the periphery of the city.

A longitudinal-type questionnaire, in two parts, was administered. Part One concerned household composition and residential history. Part Two was to be administered to an individual within the household, at least twenty-one years of age, whose identity was determined by means of a selection table printed on the questionnaire. Part Two was designed to secure details about the selected individual's present situation, and his history of residential movement, church relationships, and occupations.

Results

The interviewing process was complicated by the large number of steel workers in the area, whose changing shifts made them difficult to reach, and by the occurrence of a major steel strike during the summer of 1956. After a reasonable number of call-backs, the interviewers returned 168 complete questionnaires and 18 with household information only.

A careful check of the characteristics of the 225 households in the City Directory sample satisfied the writer that the 168 cases on which information was complete were representative on most important items. The study sample was somewhat under-represented by males, one- or two-person households, Roman Catholics, and persons over 45 years of age.

The completed questionnaires proved to be internally highly consistent. While numerical differences were often small, they tended to support the central hypothesis, that the denominational loyalty of mobile residents is a product of three inter-related sets of factors: 1) the integrative strength of the denomination which was influential in the formative years; 2) the impact of unique experiences during the life history (crises, mixed marriages, etc.); and 3) the effect of changes in family situation which accompany changes from one stage to another of the life cycle of the family.

Conclusions

All of the findings must be interpreted in the light of the characteristics of the area studied: a family-centered area, strong in Roman Catholic and liturgical Protestant traditions. It should be borne in mind that each respondent moved at some time to his present address, and that the study sample was equally divided into two duration-of-residence groups: those living at their present addresses less than, and those living at their present addresses more than, four years.

1. The respondents who showed clearest denominational loyalty in their life histories were: Roman Catholics; individuals reared in denominations most akin to Roman Catholicism; and persons who were not involved in mixed marriages.

2. Those most likely to cross denominational lines were: individuals with non-liturgical Protestant background; Protestants who married other Protestants of a different specific denomination; individuals who experienced a clear break in membership continuity during their life histories; and persons who had a late start in their relationships with organized religion.

3. Those most likely to remain technically loyal to their denominations, but prone toward "dormancy" or "marginality" in church relationships, were: respondents who did not resolve religious differences after a mixed marriage; and persons whose motives for current congregational membership were strongly influenced by family ties and local traditions.

4. The nature of Protestant congregational life fosters more change in the intensity of participation, after a residential move, among Protestants than among Roman Catholics.

5. Among the life cycle changes which influence membership and participation are marriage, and the approach of one's children toward the age of full congregational membership. However, life cycle changes are followed by more fluctuation in Protestant than in Roman Catholic participation.

6. Among the respondents, upward occupational mobility had at least two effects: it promoted membership, and it improved the chances for leadership within a congregation.

Microfilm $5.45; Xerox $19.35. 428 pages.

SOCIOLOGY, FAMILY

FAMILY DISORGANIZATION AS ASSOCIATED WITH SEVERITY OF HANDICAP (BY CEREBRAL PALSY) OF A MINOR CHILD

(Order No. 61-3669)

William Thomas Hall, Ph.D.
University of Minnesota, 1961

This study was an attempt to ascertain the effect of severity of physical handicap of a minor child on family functioning. The theoretical framework utilized concepts of social role as developed in social work, sociology, and the social sciences; stress and crisis theory developed in psychiatry and the social sciences and concepts of case-finding and prevention from the field of public health. The study proposed that a physically handicapped minor child constitutes a stress factor, or crisis in a family requiring a reorientation of role expectations on a long term or permanent basis. Also, it proposes that as the severity of the physical handicap increases the greater are the demands upon family members, particularly the mother, for more investment of physical and psychological energies in one area of role functioning, requiring a concurrent restriction of other role activities. This, in turn, necessitates role reorientation of other family members.

All reported cerebral palsy patients within the city limits of Saint Paul and Minneapolis, less than twenty-one years of age, living in their own homes and having no cerebral palsied siblings were rated as to severity of handicap through assessment of their activities of daily living. From this total sample of 309 who were thus rated, two sub-samples of thirty each were randomly drawn from either end of the severity scale providing a "mild" and a "severe" group.

An interview schedule was devised which included factors relating to family interaction and family transaction patterns. Factors relating to family interaction included parents' marital relationships, parent-child relationships, and sibling relationships. Family transaction patterns included role performance in family-community relationships, participation in social, religious, and civic groups, job stability, family mobility, economic factors and recreation and leisure time activity.

In every case the mother was contacted in her own home by the single investigator appearing unannounced, and a semi-structured interview carried out. The mild and the severe groups were then compared on the factors described above. A chi-square test was used for analysis of data.

In summary the findings were: 1) families in which there was a severely cerebral palsied child had lower (or less adequate) family-relationship-family unity scores; 2) mothers in the severe group reported significantly more feelings of continued guilt, denial, and futility, showing less adequate adaptation to the stress of having a handicapped child in the family; 3) the severe group was more stable as to residence, moving significantly less often; 4) mothers of the severely handicapped child are more likely to remain in the home rather than being employed; and 5) families of the severely cerebral palsied child are more acutely aware of gaps in community services.

In terms of family interaction then the severe group showed significantly more problems in adapting to the stress of having a cerebral palsied child in the family. In family transactional patterns the two groups were very similar. The severe group then appears to constitute a high risk group in terms of potential family breakdown.

Since the problems of family functioning as shown by this study were in the area of family interaction rather than family transaction, difficulties in prevention and casefinding are posed. Disturbances in family interaction are likely to be less obvious and it requires that the health and welfare personnel who will have early contact with those families be especially sensitive to clues of family disturbance and alert to providing anticipatory guidance.

Microfilm $2.75; Xerox $7.80. 169 pages.

A SOCIAL STUDY OF THE RESPONSES OF PATIENTS AND THEIR FAMILIES TO MULTIPLE SCLEROSIS

(Order No. Mic 61-2011)

Harry Scott Moore Jr., D.S.W.
University of Pennsylvania, 1959

Supervisor: Dr. William D. Turner

Purpose — The study comprises a descriptive analysis of activities, attitudes, and relationships, as given by thirty multiple sclerosis patients and by some of their relatives, in interviews in the homes of the patients in 1957 and 1958.

Method and Scope — Interviews were held with twenty patients registered at the University of Pennsylvania Hospital Multiple Sclerosis Clinic and ten patients listed in the files of the Eastern Pennsylvania Chapter of the Multiple Sclerosis Society. The patients interviewed were selected in a random manner.

The study began with unstructured interviews, but the pattern stabilized after the second interview to a consideration of the following factors: history of the disease, including symptoms and changes in disability; medical care and attitudes toward it; ways of handling the disease in terms of efforts at maintaining activities, changes made necessary by the disease, and relationships with friends and relatives; efforts to secure help; and comparison of modes of living before and after the onset of multiple sclerosis.

Findings — The descriptions by patients and their families of attitudes and experiences in responding to multiple sclerosis were organized into four categories: I. Productive, satisfying change (13 patients); II. Maintenance of activities without expressions of satisfaction (9 patients); III. Focus on problems, but some efforts at maintaining or developing activities or change in attitudes (5 patients); and IV. Active fighting against recognition of strength (3 patients).

As single factors, mobility status, duration of the disease, and course of the disease, showed no clear relation to the response groups. At the time of onset of the disease only two patients described critical economic situations and all were engaged in full-time responsible activities. At the time of interview there were six critical

economic situations, five involving married male patients with children. The interrelation among extent of disability, course of disease, family constellation, major activity at time of onset of disease, and economic status indicated that these reality factors were crucial rather than unimportant in the eight situations in response groups III and IV.

Ability to value highly partialized activities, such as the mechanics of being able to reach a friend's car to be driven to work, comprised the psychological difference between living creatively with multiple sclerosis or being overwhelmed by anxiety. However, the interrelation of the reality factors discussed above regarding patients in response groups III and IV suggested that it would be unwarranted to attribute their difficulties to psychological problems alone, in the absence of help with reality problems.

The literature on multiple sclerosis and other chronic diseases stressed psychological factors of dependency, hostility, and regression. Neither the creativity of many patients in this study or the pressing reality problems of other patients is explicable in terms of these sweeping psychological generalizations.

Implications for Social Work Help — None of the patients in this study or their families was active with any social service department or agency, except one family on public assistance. The problems presented suggested the need for the extension of disability insurance, development of new skills for gainful employment within physical limitations, housekeeping and nursing services, and counselling services in a few situations to help patients handle disturbing relationship problems, not accompanied by severe reality problems. Two traditional activities of social work are emphasized; the offering of concrete services and participation in social action.

Microfilm $2.75; Xerox $7.40. 159 pages.

OPTIMAL FACTORS IN MARITAL DECISION MAKING WITH ONE HUNDRED FORTY METHODIST MINISTERS AND THEIR WIVES

(Order No. 61-3741)

Ernest John Troutner, Th.D.
Boston University School of Theology, 1961

Major Professor: Dr. Walter G. Muelder

The Problem of Research

The research project sought to discover the optimal factors in marital decision making for 140 couples chosen from a group of ministers and their wives, with two or more children, in the California-Nevada Conference of the Methodist Church. The project questioned the spouses regarding their role concepts and the reactions of each in their performances of the same.

Furthermore, the questionnaire asked for a review of the major decision making areas in intra-pair, family relationships. An evaluation of the optimal factors, so considered by the decision makers, was gathered and presented from the data received. The relevance of religious principles and observances for marital-familial decision making proficiency was considered.

Conclusions From The Data

1) The couples in these parsonage homes indicated that authoritarian patterns have and are diminishing in principle and practice. The male sample reported 40.7% authoritarian government in their parents' home as compared to 12.8% in their own home. While male roles have changed greatly with females assuming more diversified freedoms and activities in and out of the home, nevertheless, the husband/father plays the over-all more dominant role as decision maker according to the data gathered in the sample. The males reported 34.3% against 18.7% for a more dominant position in question 49 concerning matters for final decision.

2) Inquiry was made in the following major areas of consideration for decision making: affectional needs and satisfactions; financial concerns; vocational and social involvements; inter-family activities; family size, training and discipline; religious beliefs and practices. In every area the data told of an increasing order of shared responsibility among those studied. In questions 36 and 37 the data indicated the overlapping of family responsibilities between the married pairs and those particular areas where more responsibility is assigned to each. For example, one fifth of the wives (20.7%) felt they had the major "concern for family tradition and solidarity."

3) Those attitudes and principles most important in decision making for both sexes in frequency and significance were: i) understanding, ii) appreciating another's point of view, iii) honesty and genuineness. For the personal qualities most significant in another scale (question 65), the couples reported in frequency and importance as follows: i) open-mindedness, ii) the quality of love, iii) basic integrity, and iv) humility and admitting one's errors.

The procedures most important to satisfactory decision making in order of frequency and significance were checked by those who had i) "a central unifying purpose" and those who reported ii) "family oneness with appreciation and understanding."

Where the husband and the wife made most decisions together, statistically significant differences between them and those who made them independently are with the use of these procedures reported in order of frequency and importance: i) "We discuss items of joint family concern if and when any issue arises," ii) "With differing points of view, we find an alternative which comprises individual positions," and iii) "We take time in our family to review overlapping ideas and activities of family members."

4) Those studied reported they believed Christianity supported their positions regarding their marital roles. The husbands replied affirmatively with 87.8% and the females with 93.5%. The open-ended questions expressed in the replies indicated the relevance of religious values for their decision making procedures. The statistical significance reported for "those who checked a central unifying purpose" points to the importance of theological foundations. Those attitudes, principles and procedures named as most significant in the decision making process cannot be divorced from the religious values inherent in the Christian faith.

While the couples in this atypical universe reported that the two were one in God, the nature of this mystical union appeared to be generally misunderstood; its relevance to marital-familial decision making was questioned and the need for a more careful interpretation expressed.

Microfilm $2.75; Xerox $8.80. 194 pages.

FAMILIAL PROBLEMS IN LIVING WITH CHILDHOOD MUSCULAR DYSTROPHY: A STUDY OF EIGHTEEN FAMILIES, DESCRIBING THE SOCIAL PROBLEMS WITH WHICH THEY HAVE TO COPE IN CARING FOR THEIR SONS WHO HAVE PROGRESSIVELY DISABLING MUSCULAR DYSTROPHY, WITH SOME CONSIDERATION OF COMMUNAL RESOURCES WHICH WOULD BE DESIRABLE IN PROVIDING SOCIAL SERVICES TO THESE FAMILIES.

(Order No. Mic 61-2015)

Harold J. Wershow, D.S.W.
University of Pennsylvania, 1960

Supervisor: Dr. Rosa Wessel

Statement of the Problem. The purpose of the study was to add to the existing body of knowledge of the ways in which families with dystrophic children cope with the problems of raising these disabled, progressively wasted children. The areas in which they may require professional help to strengthen and maintain family unity were among the subjects of inquiry. It was assumed that the families' ability to cope with their sons' illness was associated with their capacity to engage in meaningful social relationships, and the latter was chosen as the measure of their ability to live successfully with the illness. The study was of an exploratory nature; its findings were to be useful in formulating hypotheses for future investigations.

Procedure. The study universe included eighteen families with a total of twenty-three dystrophic children. This was all but one of the families with dystrophic children who were in active contact with the Johns Hopkins Hospital from November, 1957 to December, 1958, who lived in Baltimore City and four adjacent counties. The chief method of inquiry was the face-to-face interview, using a semi-structured interview schedule which was developed using ten of the families and then employed with all eighteen. Thus, ten families were interviewed twice and eight once. Mothers were the major respondents, but eleven fathers were also interviewed. In addition, the families were observed during meetings and family parties arranged by the Muscular Dystrophy Association and during visits to the hospital clinic.

Findings. Almost all of the parents and most of the children achieved a good adjustment to the illness. They accepted the diagnosis realistically and lived without evidencing great stress and constant anxiety. There was little sibling rivalry and the disabled children were generally courageous and cheerful, despite their isolation from other children. A substantial portion of the children could attend school if special schooling and bus service (including provision for lifting the children on and off the bus) were provided. Despite the positive features described, half the families did not feel themselves to be living successfully and to be people of worth.

There was no association between families' response to illness and obvious stress factors, such as the degree of the child's disability, his being mentally retarded, having more than one dystrophic child or a large family. A large proportion of the better adjusted families were those in sounder economic situations, and those who had more suitable housing.

Conclusions. Resources that would be helpful to these families were suggested. These included the provision of constructive use of the leisure time of the dystrophic children through the skills of occupational therapists and using organized neighborhood activity, such as Scouting and Sunday School, and a program of home physical therapy, taught to the parents and administered by them to the children. Social work services were also suggested, as were other services, such as the use of homemakers during the mother's illness and vacations, provision of housing and schooling geared to the needs of all neurologically and orthopedically handicapped children. Many of these services could best be offered through a coordinated home care program.

The over-all impression of the study was that the families studied evidenced great strength and unity. It is believed that overgeneralizations have often been made and that regressive and neurotic aspects of this illness may not be as widespread as is often feared. The suggestion was made that further research be designed to test the hypothesis that families with dystrophic children exhibit no greater social pathology than similar groups of families which have no handicapped children.

Microfilm $3.85; Xerox $13.50. 300 pages.

SOCIOLOGY, PUBLIC WELFARE

THE PROCESS OF PLANNED COMMUNITY CHANGE: A COMPARATIVE ANALYSIS OF FIVE COMMUNITY WELFARE COUNCIL CHANGE PROJECTS.

(Order No. 61-3450)

Milton Lebowitz, D.S.W.
Columbia University, 1961

This study involves the testing of Lippitt's model of a planned social change process using several Community Welfare Council projects as objects of examination. It was hypothesized that the Lippitt model of a change sequence represented an appropriate approximation of the Council change process, and his definition of the client system and change agent was appropriate to that process.

Since the Lippitt model represented a recent attempt to formulate the stages of development in the general process of planned change, it enabled the researcher to

use a definition of planned change, the phases of that process, the nature of a change agent in an examination of social action programs in several cities in the United States.

Since a Community Welfare Council possesses no formal coercive powers, it must depend upon persuasion and public opinion backed by social responsibility, effective participation by responsible groups, and communication with the public. There is great difficulty in securing action on such controversial issues as race relations, social security, health, housing, and the expansion of services. How the worker attempted to reconcile these diverse interests enmeshed in the power structure of a local community, the conditions of interaction between himself and the client system, are examined as a focus in the change process.

This comparative analysis of five Council change programs revealed certain inadequacies in the Lippitt framework: the nature of the change agent, precise specification of the primary client system, the characteristic structural relationship between the agent and system in the Council change process. The seven phase change model generalized by Lippitt was found to be largely inaccurate and inappropriate to the Council change process. Further, the role of the council worker as a change agent is substantially different by interaction with the specific power elements engaged in social action at the Community Welfare Council level.

The author develops a refined framework for analyzing social change at the Council level based upon a new set of forces or elements seen to be essential to this special complex of interaction in a community. This framework will be further tested by its current use in process recording in several Community Welfare Council projects conducted by the Research Department of The United Community Funds and Councils of America.

Microfilm $2.75; Xerox $8.60. 189 pages.

A STUDY OF THE SOCIAL DETERMINANTS IN THE DECISION TO SEEK MEDICAL HELP BY PERSONS WITH SURGICALLY TREATABLE SENILE CATARACTS

(Order No. 61-3457)

Irving Miller, D.S.W.
Columbia University, 1961

Cataracts remain the leading single cause of blindness, despite the fact that they have become very amenable to successful surgical intervention. Estimates of operable cataracts range from 80 to 90 percent and successful operations in this group are estimated at about 90 percent. These favorable proportions do not appear to be reflected in any substantial reduction in cataract blindness. Data and experience of the New York State Commission for the Blind, social agencies, ophthalmologists and the National Society for the Prevention of Blindness, the initiator and sponsor of this study, forced the inference and created the assumption that significant numbers of people suffering from cataracts are needlessly blind because they do not undergo surgery, even when the recommendation is clear and the prognosis favorable.

This study inquires into why people who are blind and who have a good chance for restoration of vision do not avail themselves of help. In other words, what factors influence or are associated with the decision to undergo eye surgery? It was hoped that such information would enhance knowledge of decision making about utilization of medical services and provide data for a program of prevention and education.

The basic methodology consisted in interviewing about 150 persons registered (as is legally required) with the New York State Commission for the Blind in 1955 and 1956, residing in New York City, with a primary diagnosis of senile cataracts. The operating assumption was that there were a number of socio-psychological factors which could distinguish between persons who did or did not undergo surgery despite a favorable prognosis. Thus the interview-questionnaire contained items which upon analysis could render more plausible the existence of variables which discriminated between these two groups. The hypotheses implicit in the interview-questionnaire included the following:

1) People to whom relevant medical information was given and interpreted were more likely to undergo surgery.

2) People who used clinic services primarily, who were located in the lower economic group, who were older, who lived alone or were isolated from family, and who had secondary debilitating conditions were less likely to undergo surgery. Among the items covered and information sought in the interview-questionnaire were the following: age, education, ethnicity, social characteristics, financial status, medical history, attitudes, etc.

In general, the findings support the actuality of the problem as defined and described. A cautious estimate would be that at least 40 percent of those reported blind from cataracts are or were treatable and at least half of these have failed or are failing to undergo surgery. The factors most associated with this failure (more marked among women) consist in financial dependency, social deprivation, isolation and ignorance compounded by inadequate medical and medical-social work services.

Implications of the study for planning and program include educational campaigns directed to doctors, patients and social agencies. Also called for is a program of case finding and home visiting to encourage and assist isolated and neglected persons with surgically treatable cataracts to get appropriate medical services.

Microfilm $2.80; Xerox $9.90. 216 pages.

AN INVESTIGATION OF CONFLICT BETWEEN COTTAGE PARENTS AND OTHER STAFF IN JUVENILE CORRECTIONAL INSTITUTIONS

(Order No. 61-3899)

Irving Morris Piliavin, D.S.W.
Columbia University, 1961

The purpose of this research was to gain information about factors leading to, and consequences resulting from, cottage parents' conflict with their supervisors and agency caseworkers in juvenile correctional institutions. The study sample consisted of cottage parents, their supervisors, and caseworkers at two correctional institutions

located in the state of New York. One institution was supported through private funds; the other was under public aegis. The major findings were as follows:

1. In relation to their perception of the major purpose of their agencies, all workers agreed this to be the rehabilitation of their charges. However, in terms of intermediate goals, it was found that cottage parents' treatment ideology was related to their communication patterns with other staff. At the public agency, the cottage parents' ideology was similar to that of their supervisors, with whom they had frequent contact, and dissimilar to that of clinic workers, with whom they had little communication. Further, in contrast to the public institution cottage parents, those at the private agency had frequent formal contact with caseworkers and verbalized a treatment ideology similar to the professionals.

2. At the private agency, where caseworkers had a comparatively active treatment function, they and cottage parent supervisors disagreed with cottage parents regarding the appropriate scope of the cottage parents' treatment role. The cottage parents believed their appropriate treatment role to be broad, and opined that it included counseling of inmates. Caseworkers and supervisors believed this role to be restricted to supportive parental functions. At the public agency, where caseworkers had little opportunity to treat inmates, cottage parents, their supervisors, and caseworkers agreed that cottage parents should have broad treatment responsibilities, including counseling of inmates.

3. Private agency cottage parents, who were expected to maintain order and provide individualized care, admitted having to forego individual care, on occasion, in order that control considerations be met. Public agency cottage parents, whose treatment ideology was not apparently affected by the individualized ideology of agency caseworkers, did not experience a treatment-control dilemma, since control was to them an intrinsic part of treatment.

4. At the private agency, where caseworkers and cottage parent supervisors saw themselves as having the authority to direct cottage parents treatment activities, these workers generally regarded cottage parents' deviations from their directions as due to the personal inadequacies of the cottage parents. At the public agency, cottage parent supervisors and caseworkers generally saw cottage parents' failure to follow direction as based on valid reasons. This finding was expected of the caseworkers who did not see themselves as having authority to direct cottage parents' activities, but it was not anticipated of the supervisors who regarded themselves as having the authority to provide treatment direction to cottage parents.

5. At the private agency, negative assessments by caseworkers of cottage parents led to the neutralization of the cottage parents' influence within formal committees making inmate decisions. Further, the assessments by caseworkers and cottage parents of one another led to a reduction in the informal contacts these workers had with one another. At the public agency, cottage parents were seen as competent to provide information to committees making inmate decisions, and these workers had a powerful influence on the committees. While cottage parents and caseworkers had little informal contact, this was seen by both groups as due to the inability of caseworkers to provide assistance to cottage parents.

One of the major implications of the above findings is that the conflict found among private agency cottage parents, their supervisors, and caseworkers may have been the result of those features of the agency marking it as an intensive service facility. However, in view of the very limited sample utilized in this study, this implication must be regarded as tentative. Urgent need exists to determine the degree to which the study findings can be generalized to other institutional settings.

Microfilm $2.75; Xerox $9.00. 197 pages.

PROFESSIONALISM AND ORGANIZATIONAL STRUCTURE. TRAINING AND AGENCY VARIABLES IN RELATION TO PRACTITIONER ORIENTATION AND PRACTICE.

(Order No. 61-3464)

Herman Piven, D.S.W.
Columbia University, 1961

This project addresses three central questions whose interrelationship is often overlooked in the profession and field. (1) Do probation-parole practitioners trained in social work perceive and evaluate criminal offenders more positively, and define and carry out critical role obligations with greater priority on client service and treatment, than do probation-parole personnel not trained in social work? (2) Do probation-parole agencies systematically differ in the nature and extent of their patterned demands for practitioner accountability to organizationally imposed norms relating to service and treatment of the individual client? (3) Does a clear relationship exist between practitioner orientation and performance, and the extent of functional autonomy which is provided by the agency?

(1) A Client-Welfare-Orientation questionnaire was constructed using guides from earlier depth interview research on significant correctional practice issues. The appropriate professional norm for each question item was established by deduction from social work literature, and empirically tested by questionnaire responses from casework faculty in four schools of social work.

The instrument was administered, under equivalent conditions which protected anonymity, to male practitioners supervising adult male clients in five metropolitan probation-parole agencies. As hypothesized, social work personnel were far more positively oriented to Client-Welfare than practitioners without such training; this difference disappeared, however, when the employing agency was held constant.

Violation Report activities of practitioners in two agencies were analyzed to yield four measures of performance. Differences between the two training groups, though in the direction hypothesized, were generally slight and did not consistently maintain in both agencies. Social workers

were somewhat more prone to allow a longer period of time to elapse since contact before charging clients with absconding in a Violation Report, less prone to charge violation of technical rules, more prone to report serious charges based upon court conviction, and less prone to recommend revocation of the client's community freedom.

(2) An Autonomy-Restrictiveness questionnaire was constructed to ascertain the extent of organizationally imposed restraint upon the practitioner in planning and implementing case goals and methods with his individual clients. As hypothesized, practitioners located in the two federal agencies were provided far greater functional autonomy than were practitioners located in any of the three state agencies. This condition is apparently related to structural features--such as the partialization of power over the organization-attendant upon the level of government at which agencies are located.

(3) Practitioners employed in the two Autonomous federal agencies were far more positively oriented to client service and treatment than similar personnel employed in any of the three Restrictive state agencies. Large orientation differences maintained between the two sets of agencies regardless of position, training, or experience of respondent sub-groups. Simultaneously, significant orientation differences did not obtain within any of the agencies.

Performance measurements comparing activities in the Autonomous federal agency and relatively Restrictive state agency (but most Autonomous of the three state agencies) disclosed very large and consistent patterns of difference. Functionally autonomous federal workers waited three times as long, for example, before charging clients with absconding in the Violation Report. Performance differences between the two agencies maintained when four worker and client variables were held constant; simultaneously, no significant patterns of performance difference obtained within either agency by these variables.

These and related data strongly indicate the potency of the welfare organization to control practitioner activities and command adherence to practice norms which may oppose those of the profession. Rational professional interest would seem to require policy reassessments in terms of a reoriented perspective on the interdependence of professional and agency structures.

Microfilm $3.75; Xerox $13.30. 292 pages.

CASEWORK PRACTICE IN THE INSTITUTIONAL CARE OF DISTURBED CHILDREN: A COMPARATIVE STUDY.

(Order No. Mic 61-2013)

Bernhard Scher, D.S.W.
University of Pennsylvania, 1961

Supervisor: Dr. Rosa Wessel

The purposes of this study were: 1) to develop a method for the systematic analysis of casework activity in the institutional care of disturbed children, and, 2) to study the actual content of casework practice in a group of clinically oriented institutions for children in order to determine what is generic and authentic in such practice.

Four generally comparable institutions were selected for study after consultation with recognized experts. "Agency approved statements" covering intake, in-service care and after-care were prepared for each institution from information secured from manuals, other materials and staff conferences. Drafts were submitted to each agency for review and were corrected until they secured agency approval. These statements, which are equivalent to casework manuals, were used to establish an "ideal" picture of each agency's plans for its casework, with which practice could be compared.

Actual casework practice was studied by analyzing two series of casework records selected from the 12 months experience of each agency immediately prior to the time its records were examined. One series consisted of a minimum of 25 cases opened for intake study in each agency in the selected period. Cases were chosen by arranging all cases by date of opening and selecting every "nth" case, adding cases by selecting the "nth" of those remaining in order to make the sample accurately reflect the sex distribution and certain other characteristics of the whole population. A second series of 20 cases closed in the same period in each agency were used in the study of in-service and after-care. These were selected in essentially the same way as were the intake records.

Casework entries in these records were analyzed and classified under 53 headings. The concept of casework operations was developed to aid in this process. A casework operation was defined as an identifiable activity involving a caseworker and characterized by its content, the class of client involved, and the place where the action occurred. In order to compare agency practices all operations were grouped into three categories. Group I consisted of content clearly related to the concrete services of the agency; Group II of content not essentially related to such services; Group III of content the relationship of which to the concrete services of the agency was unclear.

Actual practice was found to correspond closely to "ideal" practice, except for the period of after-care. Significant differences exist between agency practice and that described in the professional literature. Intake in three agencies was wholly diagnostic. Only one agency regularly offered help to clients at intake or in a pre-admission process. During placement, casework was almost wholly limited to work with children except in one agency. Institutional casework resembled "counseling" practice in all agencies and was equated with "therapy" in three. The fourth devoted substantially more attention to Group I content and distinguished between casework and therapy. After-care was compulsory in one institution and was offered to selected cases in two others. The fourth provided no after-care with its own staff. In those which provided after-care the service was generally minimal and ineffective.

The study developed a method for analyzing and comparing institutional casework practice as reflected in case recording. The findings raise questions concerning the role of the caseworker at intake, the nature of institutional in-service casework and the structure of present after-care services.

Microfilm $3.65; Xerox $12.85. 282 pages.

SOCIOLOGY, SOCIALISM, COMMUNISM, ANARCHISM

THE GOAL AND MEANS OF THE COMMUNIST SOCIETY: A CHRISTIAN ETHICAL ANALYSIS.

(Order No. 61-3058)

Zoltan Joseph Fule, Th.D.
Union Theological Seminary
in the City of New York, 1961

A second listing. For abstract please see page No. 1273.
Microfilm $4.45; Xerox $15.75. 346 pages.

SPEECH – THEATER

A HISTORY OF THE LEGITIMATE THEATRE IN ST. PAUL, MINNESOTA FROM 1918 TO 1939.

(Order No. 61-3655)

Thomas Owen Andrus, Ph.D.
University of Minnesota, 1961

This study is recorded in the belief that a complete history of theatre in America cannot be written without including the theatre history of cities outside of New York, Boston, and Philadelphia. Post Graduate studies of theatre outside these cities indicate that a considerable amount of theatrical activity existed across the nation.

This study is a continuation of a theatrical history of professional legitimate theatre in St. Paul, Minnesota initiated by Frank M. Whiting and extended by William Newgord. The purpose of this study is to investigate the available records of theatre activity in St. Paul during the period from 1918 to 1939, and relate this theatre activity to the cultural and economic climate then existant in the city and the nation.

Sources of material for this study include newspapers, postgraduate studies, histories and reminiscences, private papers and press books, program collections, public records, as well as a number of personal interviews with people who were intimately connected with theatre in St. Paul during the period considered. The major sources have been reviews and press releases from the St. Paul Daily News and the St. Paul Pioneer Press along with the private papers, press books, programs, and record books of the late L. N. Scott.

Legitimate theatre is taken to mean that form of theatrical activity in which the actor and the audience are in a face-to-face relationship and where the actors perform dramatic writings called legitimate plays, as opposed to other works called opera, musical comedy, revues or movies. The legitimate play is taken to be those writings in which the major emphasis is placed on plot, characterization, or mood, and not music. This definition does not bar from consideration the play in which some songs may be sung or in which the action may be accompanied, partially or wholly, by incidental music.

In this study the professional is taken to mean that person who habitually earns all, or the major part of his living from theatrical activities and not simply that he is paid for his services.

The main body of this study is divided into two sections. One section deals with the information available about resident stock companies, touring productions, theatres and technical equipment, theatre personalities: managers and critics. This information is treated in relationship to the social historical background of St. Paul from 1918 to 1939.

The second section contains appendices of touring productions and resident stock companies. These appendices include a chronology of legitimate productions, index to actors, and an index to plays.

This study attempts to show that the professional legitimate theatre activity in St. Paul declined through the years of 1918 to 1939 not only because the theatre public deserted the theatre for other forms of entertainment, but that St. Paul theatre deserted society by failing to change to meet the changing times.

Microfilm $4.05; Xerox $14.20. 314 pages.

AN APPROACH TO THE TEACHING OF ORAL INTERPRETATION IN TERMS OF DRAMATIC ACTION

(Order No. 61-3663)

Mary Virginia Fredricks, Ph.D.
University of Minnesota, 1961

Adviser: D. W. Thompson

The purpose of this study is to describe and explore some implications of an approach to the teaching of Oral Interpretation in terms of dramatic action. The approach is designed to help the interpretative reader bring together the imaginative action of literature and his own active speech behavior. It provides the student with a set of

analytic terms that will allow him to use the literature (but not to misuse it) in the interpretative reading situation.

The terms selected to identify and describe the elements of action both within the speech act and within the literature are terms borrowed from drama: Scene, Role, and Gesture. The term Scene refers to the interacting relationship of the elements of time, place, and occasion. The term Role refers to the pattern of action of the actor within the scene. The elements of role that relate to the scenic elements of time, place, and occasion are time of life, place in society, and function within the occasion. Gesture is the term used to describe the individual's inner action of thought and feeling. No special merit is attributed to the terminology other than its utility in providing a functional framework for analysis of both the speech act and literary action.

The thesis is organized to indicate the way the interpretative reader can utilize this dramatic approach to oral interpretation in fulfilling his two-way responsibility to the audience and the literature. The materials in this thesis focus first on the reader's speech behavior in terms of his public role in the audience situation. The application of the terms Scene, Role, and Gesture defines the reader's response to the demands of the Scene--the audience situation--and to the demands of the Gestures of language--the literature which he is reading aloud. The use of the terms Scene, Role, and Gesture as tools of literary analysis has as its objective an emphasis upon the action being imitated in the imaginative experience of the literary selection. Such an analysis of literature emphasizes the speech elements--the symbolic action--in the literature.

Selections representing the three genres of imaginative literature taught in courses of Oral Interpretation at the University of Minnesota--fiction, poetry, and drama--were chosen for illustrative analyses. Three stories, six poems, and three one-act plays representing significantly different degrees of relative emphasis upon each of the patterns of action were analyzed as examples of the way the dramatistic terms may be applied to the analysis of specific works of fiction. The stories analyzed are "A Little Cloud" by James Joyce, "Death of a Travelling Salesman" by Eudora Welty, and "The Grave" by Katherine Anne Porter. The poems selected for analysis include "The Heavy Bear" by Delmore Schwartz, "Love Calls Us to the Things of This World" by Richard Wilbur, "The Portrait of a Lady" by T. S. Eliot, "Pursuit" by Robert Penn Warren, "Shiloh" by Herman Melville, and "God's Grandeur" by Gerard Manley Hopkins. The three plays analyzed are "Purgatory" by William Butler Yeats, "A Phoenix too Frequent" by Christopher Fry, and "Riders to the Sea" by John M. Synge.

The argument of this study is that through the use of a set of analytic terms which will permit him to perceive both the speech act and the literary action as part of the total action of Oral Interpretation, the reader will be better able to re-create for an audience the symbolic action of the literature through the use of his own symbolic gestures--his audible and visible responses.

Microfilm $4.60; Xerox $16.20. 359 pages.

A RHETORICAL ANALYSIS OF THE SPEAKING OF MRS. ELLEN G. WHITE, A PIONEER LEADER AND SPOKESWOMAN OF THE SEVENTH-DAY ADVENTIST CHURCH.

(Order No. Mic 61-1149)

Horace John Shaw, Ph.D.
Michigan State University, 1959

Major Professor: Kenneth G. Hance

This study examines the speaking practices of Mrs. Ellen G. White and the responses secured by her as a speaker-leader. Subsidiary purposes seek: (1) To place her in a speaker perspective within her church and among other feminine speakers; (2) To provide for further research materials in the field of homiletics; (3) To present the initial texts and topics of her discourses; (4) To prepare chronological, geographical, and topical listings of her discourses; (5) To survey the living persons who heard her speak with a view to classifying and preserving their comments.

Chapter I surveys Mrs. White's life, spanning 1827-1915, and traces the circumstances under which she grew up, and points out the contributions she made during her years of public speaking.

Chapter II examines the intellectual currents of her day; and her relationship to many of the reform movements.

Chapter III shows Mrs. White's spokeswoman role for a minority group which became a world-wide denomination.

Chapter IV deals with her Health and Temperance speaking.

Chapter V surveys 279 Faith and Living discourses.

Chapter VI considers 166 discourses that relate to Mrs. White's promotion of church-sponsored activities.

Chapter VII analyzes Mrs. White's speaking by considering the canon of delivery. To aid in evaluating her delivery, the responses of 367 people who heard her speak are utilized.

Chapter VIII seeks to determine Mrs. White's effectiveness by analyzing the 367 responses, and other source materials.

Chapter IX provides summary and conclusions.

This study of 465 discourses Mrs. White presented in eighty-two known cities or towns in ten countries of three continents, suggests certain conclusions:

1. Invention-wise, Mrs. White developed ideas, mainly admonitory in nature, that depended little upon elaborate processes of reasoning. In exposition she used chiefly explanation. For confirmation she frequently used Biblical examples, cause-effect reasoning, and reasoning by analogy. Her own ethical appeal was enhanced by the generally accepted designation of her as an appointed "messenger." In her pathetic proofs she was sensitive to her listeners' emotions and appealed to most of the impelling motives.

2. Arrangement-wise, Mrs. White evidenced no restraints imposed by pre-planned discourse outlines. Her sequence of ideas follows a pattern of one idea growing naturally out of another. Formally stated main or subheadings are absent.

3. Style-wise, Mrs. White used more than a normal amount of restatement to achieve both clarity and force.

In brief, through all aspects of her speaking, simplicity is the one common denominator.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

4. Delivery-wise, in all of her speaking, Mrs. White's own philosophy of speech paralleled in large measure her actual practice.

5. Audience response-wise, Mrs. White achieved both immediate and long-term effectiveness. The immediate responses were characterized by respectful listener attitudes of awe and silence; verbal responses that included testimonies of confession and personal intention, frequent rejoinders of agreement expressed with hearty "Amens"; physical responses of rising to the feet, going forward, not infrequently amid tears and weeping. These immediate audience responses often had through-the-years carry-over values.

6. Effect-wise, perhaps the prime factor in Mrs. White's persuasive power resides not so much in what are commonly called the rhetorical skills, as in her personal ethos. To herself and to her hearers she was inspired of God. The truth of her past utterances were so fully proved by succeeding events that the people of her church, as well as others, viewed her with great respect, eagerness, and concern. In this way at least, she was unique as a speaker, and the effects of her speaking were unusual.

Microfilm $8.65; Xerox $30.85. 684 pages.

A RHETORICAL ANALYSIS OF EUGENE O'NEILL'S STRANGE INTERLUDE

(Order No. 61-4507)

Otis William Winchester, Ph.D.
The University of Oklahoma, 1961

Major Professor: Dr. Roger E. Nebergall

The purpose of this study is to explore the relation which exists between the arts of rhetoric and drama; its specific object is the analysis of certain rhetorical implications of Eugene O'Neill's Strange Interlude. The description and evaluation of the play's rhetoric is made from the perspective of the social and cultural values appropriate to the 1928 audience.

The general hypothesis on which the study rests is that: (1) the playwright's purpose is in part persuasive, (2) the play's themes are capable of modifying the attitudes of the audience with regard to contemporary issues, (3) the play's form functions as a means for accommodating ideas to an audience.

O'Neill's persuasive purpose, by nature obscure, is generally neglected by critics who overlook the rhetorical implications in his creative attitude and in his plays. Strange Interlude is a particularly good example of O'Neill's rhetoric since it contains ideas drawn from his career down to this time, deals with a series of major contemporary issues, and was popularly received.

The themes of Strange Interlude are both universal and specific. First, the play is the clearest dramatic statement of O'Neill's world view. He apparently believes that man, evolving from Primitive, to Puritan, to Scientific-Materialistic, has become estranged from God. Man's present state of tension and suffering, a consequence of his requiring the incompatibles of rational truth and romantic illusion, is meaningful only if it is conceived as an ennobling experience. Second, and more significant rhetorically, are those ideas which possess immediate implications for the nineteen-twenties: the confirmation of psychoanalysis, the conflict of theologies, the confusion of hedonism, the fiction of heroism, the perversion of business, the failure of science, and the ordeal of art.

The forms of Strange Interlude are imaginatively appropriate means for projecting the ideas. Plot, character, and dialogue all serve rhetorical as well as dramatic functions. Plot provides motivation and justification for the actions and ideas of the characters. The deterministic orientation and reasonableness of the plot are qualities which enhance the ideological meaning of conflict, and crisis and incident. The characters are representatives of and spokesmen for ideas. The audience tends to identify with them and thereby become empathetically involved with the issues. The interior monologue and the poetic language, both dialogue devices, are particularly notable instances of the inventiveness of O'Neill's expression.

Strange Interlude contains ideas and functions as a means for accommodating these ideas to an audience. In view of this, the study suggests that the dramatic and rhetorical functions of a play are not antagonistic; drama commonly deals with issues of the times in a particularly forceful manner, undoubtedly exercising a persuasive influence. The study also suggests that the orator consider issues as the playwright does, in their fullest immediate context. Microfilm $2.75; Xerox $8.80. 193 pages.

ZOOLOGY

RIBONUCLEIC ACID AND LENS INDUCTION IN XENOPUS LAEVIS (DAUDIN)[1]

(Order No. 61-4526)

Richard George Babcock, Ph.D.
University of Virginia, 1961

Embryos of Xenopus laevis are capable of forming self-differentiating lenses without induction by the optic vesicle if the anlage of the optic vesicle is removed from the medullary plate. Comparison of the development of these free lenses with that of normally induced lenses has revealed a striking difference in developmental pattern. In contrast to the normally induced lenses, which develop by invagination in the typical vertebrate fashion, the free lenses develop by cellular aggregation within massive ectodermal thickenings.

The distribution of RNA during lens development has been studied histochemically. Lens induction was found to be accompanied by a transient increase in the RNA content

of the optic vesicle and a subsequent increase in that of the lens primordium. This finding is in accord with observations made by other investigators on different species. Free lenses, on the other hand, contain little RNA during early stages of development. Since lenses that arise in the absence of induction by the optic vesicle are initially poor in RNA, it has been concluded that the abrupt enrichment in RNA undergone by normally induced lenses is a direct result of the inductive process.

1. This investigation was supported in part by Predoctoral Fellowship no. 7753 from the National Institutes of Health, U. S. Public Health Service, and in part by an Institutional Grant from the American Cancer Society.

Microfilm $2.75; Xerox $3.00. 57 pages.

MORPHOLOGY AND ECOLOGY OF THE BENTHIC CILIATED PROTOZOA OF ALLIGATOR HARBOR

(Order No. 61-3631)

Arthur Charles Borror, Ph.D.
The Florida State University, 1961

Morphological, anatomical, ecological, and taxonomic details of 54 species of ciliates are discussed. About 90% of the ciliates studied were originally described from other areas, mainly Europe; hence the degree of endemism in the Gulf of Mexico is low. Only three species, in the genera Tracheloraphis, Blepharisma, and Oxytricha, are apparently new. Fine structure and variation of ciliature and other taxonomically important features are discussed in relation to their applicability to systematics.

Many of the ciliates studied can be cultured easily, hence are suitable experimental material.

A new collecting method has been used to quantitatively sample two benthic habitats in Alligator Harbor, Franklin County, Florida; one habitat is well-sorted, intertidal sand (mean grain diameter = 0.2 mm.), the second mainly diatom detritus with no sand present. Abundance of at least 65 species occurring in ten quantitative samplings of each habitat are calculated. The collecting technique can be applied to microscopic infauna other than ciliates.

There may be more ciliates per unit volume in surface sand of a marine beach than all the Metazoa combined. The reverse is true of diatom detritus. Twice as many species, and five times as many individual ciliates occur per unit volume in sand than in diatom detritus, due probably to differences in salinity range, isolation, number of microhabitats, and food supply in the two habitats. Benthic ciliates are abundant and significant primary consumers of bacteria and diatoms. The low number of species common to both stations indicates that local occurrence and abundance of cosmopolitan ciliates may be determined by the type and availability of suitable microhabitats.

Many taxonomically diverse groups of ciliates contain common psammolittoral species which are flattened, narrowed, thigmotactic, and possess an elongate or fragmented macronucleus; ciliates common in diatom detritus generally lack these characters. Other features, such as posterior tufts of thigmotactic cilia and constriction of the anterior end have evolved in only a few common psammolittoral ciliates. All may be adaptations to the interstitial environment, aiding feeding, maneuverability, rheotaxis, and regeneration. Quantitative data do not support the hypothesis that body elongation, fragility, and caudal prolongation are necessary features of common psammolittoral ciliates. The only body dimension limited by the physical nature of the substrate is width. Since the maximum attainable diameter of flattened ciliates occurring in well-sorted sands of mean grain size of 0.1 and 0.2 mm. differs by a factor of two, the mean and standard deviation of grain diameter should accompany all studies of community ecology of psammolittoral ciliates.

Two or more congeneric species may coexist in surface sediment, reducing competition by differences in body dimensions, food habits, and microhabitat. In psammolittoral oxytrichs, a separation of anterior feeding organelles from more posterior locomotory organelles has evolved, possibly correlated with survival in the interstitial environment. Microfilm $2.75; Xerox $9.45. 208 pages.

PLATYHELMINTH LIFE CYCLES INVOLVING LAND SNAILS OF WESTERN OREGON AND WASHINGTON

(Order No. 61-3916)

Albert George Canaris, Ph.D.
Oregon State University, 1961

Major Professor: Ivan Pratt

Seven species of land molluscs were examined for helminth infections. Collections were made west of the Cascade Mountains in Oregon and Washington over a two year period throughout the year. Two helminth life cycles were worked out. They were a trematode Brachylaime pellucidum Werby, 1928 and a cestode, Liga soricis Neiland, 1953.

Adult flukes of B. pellucidum were found in the wild in Ixoreus naevius, Turdus migratorius, Perisoreus canadensis obscurus and Procyon lotor. Flukes were raised experimentally in Cricetus auratus.

B. pellucidum attached in the posterior one-third of the small intestine of the definitive host. Eggs were observed in the uterus within 76 hours, and they were recovered from the feces within 12 days after infection. Eggs containing miracidia hatched in the intestine of the land snail. The miracidium was pear-shaped and was provided with three major ciliated areas and a stylet. Approximately eight cells made up the body.

Sporocysts were found only in the land snail Haplotrema vancouverensi. About 13 per cent of the snails harbored sporocysts of B. pellucidum. The sporocysts were branched and were located in the digestive gland and along the intestine of the snail. At 54 days numerous small slightly branching sporocysts were present and they contained germ balls. Germ balls gave rise to brevicaudate cercariae. The cercariae were provided with six pairs of penetration gland ducts and had flame cell formulae of 2(3 + 3 + 3) = 18. Cercariae were shed and infected land molluscs by entering the pulmonary opening and migrating up the ureter to the kidney. The cercariae grew, lost their tails, and became unencysted metacercariae. Metacercariae 103 days old were infective to hamsters.

Land molluscs found infected with the metacercariae were Haplotrema vancouverensi 31%, Haplotrema sportella 21%, Ariolimax columbianus 15%, Triodopsus germana 15%, Vespericola columbiana 13%, Monadenia fidelis 3%, and Allogona townsendiana 1%.

The definitive hosts, birds and a mammal, become infected by eating land molluscs that harbor the metacercariae.

The shrews, Sorex vagrans, Sorex bendirii and Sorex obscurus harbor the adult cestode Liga soricis Neiland, 1953 in the small intestine.

Five species of land snails were infected with cysticercoids of L. soricis. The cysticercoids are generally located in the surface tissues of the kidney or the mantle of the snail. They may occur, however, in other soft parts.

The per cent of infections by cysticercoids of snails is as follows: Vespericola columbiana 11%, Triodopsis germana 2.4%, Haplotrema sportella 1.7%, Haplotrema vancouverensi 1.7% and Allogona townsendiana 1.1%.

Shrews apparently become infected by eating infected snails. The stomach from one shrew contained fragments of the shell and radula of Haplotrema sp., and 11 recently excysted cysticercoids were recovered from the small intestine of this shrew. The cysticercoids resembled the adult worms, with the same number of morphologically similar hooks on the scolex.

Cysticercoids have been fed to laboratory white mice, white rats, golden hamsters, and chickens. Only two recoveries of experimentally fed tapeworm cysts have been made. Both recoveries were from the golden hamster, one after 18 hours and the other after 60 hours. In both instances the tapeworms had not matured enough to develop proglottids.

Microfilm $2.75; Xerox $3.80. 69 pages.

A DISTRIBUTIONAL STUDY OF THE BIRDS OF MONTANA

(Order No. 61-3918)

Clifford Vernon Davis, Ph.D.
Oregon State University, 1961

Major Professor: Robert M. Storm

This study is an endeavor to assemble all of the distributional information now available on the birds of Montana. The data reported include dates specimens were observed or collected, their localities, names of observer or collectors, depositories where skins are located, breeding and migration records, and reference citations to all observations reported from the literature.

The sources of information include: 1. All Montana bird records published in ornithological literature since 1806, which involves approximately 600 separate titles. 2. The data from approximately 6,000 tagged specimens located in ten museums. Fifteen hundred of these were collected by the author and are now located at Montana State College in Bozeman. The bulk of the remainder are in the six following collections: Montana State University at Missoula, Museum of Vertebrate Zoology at Berkeley, Chicago Natural History Museum, Museum of Zoology at Ann Arbor, Stanley Jewett Collection at Portland, and the Pioneer Museum at Tillamook, Oregon. 3. The sight records of the author during a fifteen year period. 4. The field observations of graduate students and fellow biologists who have worked on related field projects. A list of these observers and their titles appears in the appendix.

A total of 333 species with 70 additional subspecies is reported. Subspecies identifications were recorded from many of the museum skins observed and a number of specimens recently taken by the author were identified to subspecies by the Museum of Vertebrate Zoology at Berkeley.

Names and sequence of presentation follow the Fifth Edition of the A.O.U. Check-List of North American Birds. Each species account includes diagrammatical summaries on seasonal and geographical distribution as well as a verbal summary covering the breeding and migration records. The distributional data are alphabetically arranged by counties, and multiple locations in each county are arranged likewise.

Three state maps are included: a topographic map of the state, a map showing the counties, and a map showing the four avifaunal areas. The avifaunal areas proposed and used throughout the species accounts are namely: 1. The Pacific slope humid area west of the continental divide. 2. The Atlantic slope mountain area along the eastern slope of the Rocky Mountains. 3. The prairie grasslands of most of eastern Montana. 4. The prairie lakes area north of the lower Missouri River in extreme northeastern Montana.

This report includes a discussion of the major physical factors believed to effect bird distribution in the state, and a history of bird study in the same area during the past 150 years. The species accounts alone require over 400 manuscript pages.

Microfilm $6.05; Xerox $21.60. 476 pages.

SELECTION AND BODY SIZE IN DROSOPHILA PSEUDOOBSCURA AT DIFFERENT TEMPERATURES

(Order No. 61-3874)

Marvin Druger, Ph.D.
Columbia University, 1961

A population of Drosophila pseudoobscura was selected for long and for short wings at two temperatures, 25°C and 16°C. Samples from the lines selected at 25°C were raised at 25°C, 19°C and 16°C, and the divergences achieved in the different environments were compared. A similar procedure was followed for the lines selected at 16°C. The selection made in one environment resulted in a qualitatively similar change in the other environments. The divergence tended to be greater in the environment in which selection was practiced.

In the lines selected for long wings at 25°C the deviation from the control at 25°C was not significantly different from the deviation from control when these lines were tested at 16°C and at 19°C. The line selected for short wings at 25°C deviated less from the control at 16°C and 19°C than it did at 25°C. For lines selected at 16°C, the plus line deviated more from the control at 16°C than it did when tested at 25°C or 19°C. The minus line selected at 16°C produced similar deviations from the control at all temperatures tried.

The control lines at both 25°C and 16°C retained the chromosomal polymorphism which was present in the foundation population. The minus lines selected at both temperatures became homozygous for the AR gene arrangement. The plus line selected at 25°C maintained the polymorphism, whereas the plus line selected at 16°C became homozygous AR/AR.

Comparison of the selection effects in the different environments suggests that achievement of short wing length at 16°C and 19°C, measured as deviations from control, may be best accomplished by selection at 16°C. Selection at 25°C and at 16°C seems to be equally effective in producing short-winged flies at 25°C. Although selection at 16°C is apparently more effective in earlier generations, the attainment of long wings at 25°C, 19°C and 16°C seems, in the later generations, to be most successful when selection is practiced at 25°C.

Microfilm $2.75; Xerox $4.00. 75 pages.

CONTRIBUTIONS TO THE BIOLOGY OF THE MUSKELLUNGE

(Order No. 61-3105)

James Robert Gammon, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Arthur D. Hasler

George and Corrine Lakes, two small northern Wisconsin lakes containing resident populations of perch and bass, were stocked with young muskellunge (Esox masquinongy immaculatus Garrard).

Within a year after the introduction, perch in George Lake greater than 100 mm. in length decreased from about 31,000 individuals to a density which was too low to estimate. In Corrine Lake, three years lapsed before a comparable reduction occurred.

The growth rate of one- and two-year-old perch increased after the reduction in the number of perch. The length-weight relationship, as analyzed by an analysis of covariance, remained unchanged.

Population levels of largemouth bass decreased because virtually no small bass survived to the third summer of life, although good numbers of fry were observed in most years.

During the study, the population level of smallmouth bass increased significantly because of a net increase in recruitment, although no strong year classes were observed.

The difference in the response of the population levels of largemouth and smallmouth bass appears to be related to a difference in the schooling tendencies and the habitat preferences of the young. Young largemouth bass school near the same type of habitat – usually vegetation – which is preferred by muskellunge, while young smallmouth bass scatter over sandy and rocky areas.

Little change in the growth rate and the length-weight relationship of either smallmouth or largemouth bass occurred after the reduction in the number of perch.

About 25% of the muskellunge stocked in the spring in George Lake was unaccounted for after one and a half months, but there was no evidence of a similar high initial mortality of the muskellunge stocked in the fall in Corrine Lake. After the initial loss, a relatively constant annual mortality rate of 20% to 25% was observed in both populations.

The course of events which followed the introduction of the predator is discussed in relation to a postulated cycle of abundance of the perch. For some intervals within the study it was possible to compare quantitatively the decrease in the abundance of the prey with the production of the predator.

Large young-of-the-year muskellunge gain approximately one gram in weight for each 2.72 grams of fish eaten.

The cycle of spermatogenesis in the muskellunge is described and compared to that in the northern pike.

The relationship of testes weight to total body weight is described by the equations: Y(testes wt. in g.) = -26.92836 + 0.01664 X (body wt. in g.) for the muskellunge and Y = 4.19720 + 0.02146 X for the northern pike.

After the completion of spermatogenesis and before spawning, the density of spermatozoa in the testes is 3.019×10^{10} spermatozoa per gram in muskellunge and 3.386×10^{10} spermatozoa per gram in northern pike. Within the lobules of the testes, the density of mature spermatozoa is about 5.131×10^{10} per ml. in muskellunge and 4.560×10^{10} per ml. in northern pike.

Microfilm $2.75; Xerox $7.40. 156 pages.

STUDIES ON INTERACTIONS BETWEEN SPERMATOZOA AND EGGS OF ARBACIA PUNCTULATA AND OTHER ECHINODERMS

(Order No. 61-3640)

Ralph Robert Hathaway, Ph.D.
The Florida State University, 1961

Studies were undertaken to clarify some of the interactions which take place between sea urchin spermatozoa and the materials, mainly fertilizin, occurring in the jelly-coat of the egg. Most attention was given to the reversible agglutination of sperm by fertilizin, and to the activation of sperm respiration by an unknown egg substance which is distinct from fertilizin.

Some of the experiments employed S^{35}-labelled fertilizin. Fertilizin was labelled in vivo following injection of sea urchins with $Na_2S^{35}O_4$ in sea water solution. Radioactive fertilizin was mixed with sperm, and the mixture was later centrifuged. Assay for S^{35} in the resulting supernatants indicated that sperm first absorb, and later release, labelled materials. Released materials containing S^{35} were not absorbed to fresh sperm, and these materials were non-diffusible in dialysis. It was concluded that the uptake and release of S^{35}-labelled materials was a molecular expression of the reversible agglutination of sperm by fertilizin.

Experiments were performed to discover if the reaction between sperm and fertilizin involved a release of sperm materials to the medium. It was discovered that materials giving a positive test for sialic acid were released during this reaction. Other agents, such as detergent solutions, distilled water, and hot and cold sea water also caused

sperm to release materials containing sialic acid. It was concluded that these materials were released in a non-enzymatic manner. The possible relationship of the release of bound sialic acid to the reversible agglutination was discussed.

An examination was made of the biological properties of extracted sperm materials. Some of these materials caused a precipitation membrane to appear around the jelly-coats of eggs. Other materials released by sperm caused the disappearance of the jelly-coats. These two activities were separated by centrifugation, and sialic acid was found to be associated with the sedimentable, precipitating agent. Materials released by sperm contained at least three antigens, and one of the antigens contained sialic acid. These results were discussed with reference to reactions between fertilizin and antifertilizin. The precipitating agent satisfies some of the criteria for antifertilizin in solution, but it was concluded that more extensive specificity tests are required to establish an identity between antifertilizin and the materials studied here.

Activation of sperm respiration occurred in the presence of solutions of jelly-coat materials, or in sea water supernatants of jellyless eggs. The experiments indicated that the activator is a small molecular weight substance which is normally present in the jelly-coat, but which probably originates in the egg. Preliminary chemical characterizations of the activator are described. Activators were discovered in three echinoderm species, and a species specificity was observed in activator action. In one of the species examined, no activator was found. Sperm of two species, when exposed to specific activator, showed a decline in fertilizing capacity. These reactions were interpreted in terms of possible functions during fertilization, however no final conclusions were reached in this regard.

Results of the various lines of investigation were evaluated in terms of (a) the clarification of reactions between sperm and egg water, and (b) the relation of these reactions to events which might be expected to occur during the first interactions between spermatozoa and an unfertilized egg.

Microfilm $2.75; Xerox $6.40. 135 pages.

SYSTEMIC INSECTICIDES FOR THE CONTROL OF THE CATTLE GRUB, HYPODERMA LINEATUM (DE VILLERS).

(Order No. 61-3012)

Fred William Knapp, Ph.D.
Kansas State University, 1961

Late in 1956 tests were initiated to evaluate the effectiveness of ronnel (0,0-dimethyl 0-2,4,5-trichlorophenyl phosphorothiate) as a systemic insecticide for the control of cattle grubs. During subsequent years, to 1960, tests were also conducted on Co-Ral (0,0-diethyl 0-3 chloro-4-methyl-2-oxo-2H-1-benzopyran-7yl-phosphorothiate); Dowco 109 (phosphoramidothioic acid, methyl-0-[4 tert-butyl-2-chlorophenyl] 0-methyl ester); dimethoate (0,0-dimethyl S-[N-methylcarbamoyl-methyl] phosphorodithioate) and Ruelene (4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate).

Various breeds of cattle totaling 2,885 head of both sexes and different ages were used at various locations in Kansas. The cattle were mainly from southwestern United States, only a few were native cattle of Kansas.

Ronnel, as a bolus, was administered at a 110 mg./kg. body weight and Dowco 109 as a bolus were administered at 3 grams per head for animals ranging from 150 to 500 pounds and 6 grams per head for any weight over 500 pounds. In all spray tests a pressure of 300 pounds and a number 5 nozzle plate were used. Co-Ral was formulated from a 25 per cent wettable powder, the Dowco 109 spray from either a 50 per cent by weight emulsifiable concentrate or a 25 per cent wettable powder and Ruelene from a 25 per cent wettable powder. Each animal that was sprayed was covered thoroughly with an estimated 1 gallon of spray. Dowco 109, sampled as a 10 per cent pre-mix in wheat bran; ronnel, sampled as a 60 per cent emulsifiable and 10 per cent pre-mix in soybean meal, and Ruelene, sampled as a 25 per cent wettable powder, were used for the feeding tests.

Treating animals with ronnel boluses at a rate of 110 mg./kg. in June, July, August and November, before grubs were present in the backs, gave 92.7, 97.9, 67.5 (average of 2 tests) and 92.0 per cent control, respectively. When ronnel was administered at the same rate to animals having grubs in the back, reduction ranged from 79.7 to 99.3 per cent with an average of 90.9 per cent. Several animals in one of the latter tests, however, showed a slight toxicosis.

When ronnel was incorporated in the feed by two different methods and fed to animals at the rate of 110 mg./kg. for 1 day in two different tests, 92.2 and 35.9 per cent reduction resulted. When fed at the rate of 50 mg./kg./day for 2 days; 75 mg./kg./day for 3 days and 8 mg./kg./day for 14 days, reduction was 4.4, 67, and 5.8 per cent respectively. Results of animals fed 2 mg./kg./day for 79 days could not be evaluated due to low grub infestation in the control animals.

Dowco 109 used as a bolus performed slightly better than when animals were bolused with ronnel (average of 97.4 per cent vs. 90.9 per cent reduction). However, ronnel was the more effective when used as a feed additive. In feed tests with Dowco 109 at 5 mg./kg./day for 3 days; 2 mg./kg./day for 6 days and 1 mg./kg./day for 12 days, reduction was 83.2, 76.7 and 43.5 per cent, respectively. In two different 1 day feed tests of 15 mg./kg., reduction was 76.7 and 45.8 per cent, respectively. The low grub reduction in the latter tests was possibly the result of inadequate mixing of the medicated feed.

Conclusive data on Ruelene as a feed additive were not available because of loss of the control animals before a grub count could be made.

Dimethoate, used as a bolus, reduced grubs present in the backs of the animals by 71.4 per cent but failed to control the migratory grubs, thus giving an over-all control of 30.6 per cent.

Application of Ruelene and Co-Ral as a 0.5 per cent spray in July and August at 1 gallon and 1/2 gallon per head, respectively, and of a 0.75 per cent Dowco 109 spray applied in November at 1 gallon per head, gave 99.1, 98.0 and 93.8 per cent reduction, respectively. A late season spray of Dowco 109 at 0.25 per cent and Co-Ral at 0.33 per cent applied at 1 gallon per head, reduced encysted grubs by 61.2 and 91.0 per cent, respectively, but failed to control the migrating grubs.

As the season progressed, grub control became progressively poorer in all spray treatments because the spray did not control migratory grubs. Conversely, the ronnel and Dowco 109 bolus maintained effective control when used either as an early season treatment or late season treatment. The feeding of ronnel, Dowco 109, and Ruelene at different rates and for various number of days showed erratic results.

Microfilm $2.75; Xerox $4.40. 84 pages.

LIFE HISTORY AND EPIDEMIOLOGICAL STUDIES ON HETEROBILHARZIA AMERICANA PRICE, 1929, SCHISTOSOME OF THE RACCOON, NUTRIA, DOG AND RABBIT.

(Order No. 61-3782)

Hong-Fang Lee, Ph.D.
Tulane University, 1961

Chairman: Paul C. Beaver

Heterobilharzia americana infection was found in 25 of 52 raccoons, 22 of 37 nutrias at Pass à Loutre Wildlife Refuge, Avery Island and Lafitte, and 1 of 3 rabbits and each of 3 dogs at Pass à Loutre, in Louisiana. The parasites were found in the veins of the small intestine, colon and liver.

Cercariae were found in 4 of 1453 Lymnaea cubensis collected at Pass à Loutre. Neritina reclivata, Tropicorbis sp., Physa anatina and Helisoma trivolvis lentum proved to be refractory to infection both in nature and in the laboratory. Although Pseudosuccinea columella was not found infected in nature, in the laboratory it was as susceptible as L. cubensis. Attempts to infect Lymnaea palustris and other species were unsuccessful. In L. cubensis, the miracidia developed into mother sporocysts which matured in 14 days. By the 17th day daughter sporocysts began to escape from the mother sporocyst and completed development in the digestive gland. Infected snails shed cercariae about 4 weeks after exposure.

The eggs are oval with thin smooth shells which averaged 87 microns in length and 70 microns in width. The miracidium resembles those of all other known species of mammalian schistosomes except that it has 22 instead of 21 ciliated epidermal cells arranged in 4 transverse rows containing from front to back 6, 9, 4, and 3. The cercaria has eyespots, a head organ with a head gland containing four nuclei, six pairs of flame cells, one of which is in the tail and five pairs of penetration glands. The tail stem is shorter than the body and the furcae bear dorso-ventral fin-folds.

Observations on the penetration behavior of cercariae indicate that they generally entered the skin via the hair follicles, and tended to migrate into and through the sebaceous glands, then into the deeper dermal layers.

Lung hemorrhages caused by the migrating schistosomulae in mice appeared on the 2nd day and reached a peak 8 to 11 days after exposure. Additional fresh hemorrhages were observed after the 14th day but these late hemorrhages were relatively small and discrete. Worms recovered from the lungs, 5 to 9 days after exposure, were few in number and showed no development. They first appeared in the liver on the 7th day and increased in number up to the 30th day. In the mesenteric vessels, although worms first appeared on the 19th day, only one to three worms per mouse (exposed to 150 cercariae) were recovered throughout the 45-day period of observation. Development of worms took place mainly in the liver. Male and female worms were recognizable on the 17th day and were sexually mature on the 40th day.

The adult male is unique in having 34-101, average 62, testes which are arranged in two more or less irregular rows and situated at the posterior third of the body. Distinctive features of the adult female are: (1) a highly looped ovary (at least four loops), (2) division of the body into a narrow preovarian portion and a blade-like postovarian portion, and (3) the presence of numerous medial and lateral dendritic diverticula of the intestinal ceca.

The pathological changes caused by this parasite were found mainly in the liver and the intestine where numerous eggs were present. Eggs were also present in the lungs, mesenteric lymph nodes, kidneys, heart, spleen and brain. The end result of their presence was the formation of pseudotubercles around the eggs and the increase of fibrous tissues which was particularly prominent in the liver.

Great variation was found in the degree of susceptibility to infection among the 10 species of laboratory animals tested. All except the monkey were susceptible to infection, i.e., schistosomes were present at autopsy. Mice, hamsters, dogs, and one raccoon (probably also cotton rats) were found to be highly susceptible, exhibiting little host resistance and discharging viable eggs in the feces. On the other hand, albino rats, rabbits, guinea pigs and cats exhibited a certain resistance which did not bar normal migration but did affect sexual or physical maturation.

Microfilm $2.75; Xerox $9.00. 198 pages.

TAXONOMY OF MARINE NEMATODES OCCURRING ALONG PACIFIC NORTHWEST COASTS

(Order No. 61-3933)

Donald Guy Murphy, Ph.D.
Oregon State University, 1961

Major Professor: Harold J. Jensen

This investigation constitutes the first contribution to a comprehensive study of marine nematodes from Oregon waters. Details on techniques employed in collecting, preserving, mounting and describing forms reported in the study are presented. Collections were made from a total of thirty stations in Washington and Oregon inter- and subtidal zones as well as one deep-sea station off the Oregon coast.

The following 27 species were described and illustrated, of which 18 species and three genera are described as new: Rhabditis marina Bastian 1865, Dolicholaimus benepapillosus (Schulz 1935), Lauratonema obtusicaudatum Murphy and Jensen 1961, Anticoma constricta n. sp., Phanoderma segmenta n. sp., Enoplus intermedius n. sp., Mesacanthion arcuatilis Wieser 1959, Pseudadoncholaimus cyathostomus n. g. n. sp., Oncholaimium gubernans n. sp.,

Simplocostoma dissoculta Wieser 1959, Pomponema polydonta n. sp., Foliolaimus tridentatus n. g. n. sp., Paracanthonchus serratus Wieser 1959, Synonchiella spiculora n. sp., Desmodora papillostoma n. sp., Onyx pararugata n. sp., Spirina cylindrostoma n. sp., Monoposthia costata (Bastian 1865), Notochaetosoma costeriata n. sp., Prochromadora trisupplementa n. sp., Chromadorina germanica (Butschli 1874), Eudenticullela setosa n. g. n. sp., Spilophorella furcata n. sp., Parascolaimus tau Wieser 1959, Bathylaimus tarsoides Wieser 1959, Rhynconema subsetosa n. sp., and Gammarinema dentata n. sp.

An unpredictable number of forms, both coastal and off-shore, offer vast opportunities for further taxonomic and ecological efforts. Such work should be encouraged with the aim of developing a continuing program of research and training in the field of marine nematology.

Microfilm $2.75; Xerox $6.60. 139 pages.

STUDIES ON THE SEROLOGY OF DIROFILARIA IMMITIS INFECTIONS

(Order No. 61-3784)

Guillermo Pacheco, Ph.D.
Tulane University, 1961

Chairman: Paul C. Beaver

Because of the uncertainty in the interpretation of results of serological tests for the filariases, there is a need for knowledge of antibody responses that can be expected in these infections. The main objectives of the study were to follow the antibody response of normal and abnormal hosts of Dirofilaria immitis with various worm preparations (test antigens) in indirect hemagglutination (IHA) and complement fixation (CF) tests, and to simultaneously obtain a preliminary evaluation of the test antigens as diagnostic aids.

The following preparations of adult D. immitis were tested: 1) ethanol extract, 2) saline extract, 3) ethanol precipitate of the saline extract, 4) saline extract of acetone-treated worms, 5) ethanol precipitate of the saline extract of acetone-treated worms and 6) an acid-soluble protein fraction of the worms.

In a CF test with the ethanol extract of whole worms, sera from experimentally infected dogs first showed antibody titers between the 3rd and 4th months of infection. Titers increased and remained high through the 7th month, after which they decreased. By the 9th month antibody could no longer be detected. In the IHA test, sera from the same dogs were found to have antibody titers as early as 3 weeks after infection when tested with a whole worm saline extract. The titers increased to reach an early plateau which extended through 3 weeks, decreased sharply, and rose a second time to reach a peak during the 5th month. After this the antibody titers decreased and could no longer be detected beyond the 9th month of infection. Further tests of the same dog sera with other worm preparations showed no difference in the over-all pattern of the curves of antibody titer as related to time. However, the ethanol precipitates and the acid-soluble protein fraction, especially the latter, were much more sensitive. No correlation could be observed between the number of larvae used to infect the dogs and the antibody titers, either with reference to the rates of production or the maximum levels reached.

In the CF test, with ethanol extracts of D. immitis, sera from experimentally infected rabbits were first found to have detectable antibodies 2 months after infection; titers increased to 1:640 by the 3rd month and remained essentially at this level through the 6th month; thereafter titers decreased and antibody could no longer be detected after 7 months. In one rabbit, reinfected after 5 months when titers were low but still detectable, there was an increase in titer within 2 weeks; a sharp increase occurred during the middle of the 6th month, but the titers decreased rapidly after 7 months and could no longer be demonstrated after 8 months.

Evaluation of the various test antigens showed that the whole worm saline extracts were not specific. The ethanol precipitates were probably the most specific of the preparations, but were less sensitive than the acid-soluble protein fraction. The latter was tested with 228 human sera, previously studied for anti-ascarid antibody titers and representing all ranges of the ascarid titers. A correlation was found between high ascarid titers and high Dirofilaria titers although the reverse was not true. Analysis of sera from 168 human beings, selected on the basis of eosinophilia, showed that there was a correlation between eosinophilias of over 20% and high anti-Dirofilaria titers. It should be noted, however, that cross reactivity was observed in sera from persons diagnosed as having visceral larva migrans, tropical eosinophilia or even schistosomiasis. On the basis of these findings, and those of others, it may be suggested that the results of tests with the worm extracts may be reflection of the degree or kind of pathologic changes rather than number or kinds of worms present in the host.

Microfilm $2.75; Xerox $4.20. 80 pages.

A BIOLOGICAL AND DEVELOPMENTAL STUDY OF COELOIDES BRUNNERI VIER., A PARASITE OF THE DOUGLAS-FIR BEETLE, DENDROCTONUS PSEUDOTSUGAE HOPK.

(Order No. 61-3939)

Roger Baker Ryan, Ph.D.
Oregon State University, 1961

Major Professor: Dr. Julius A. Rudinsky

The seasonal histories of host and parasite are described. There are three generations of C. brunneri per year, one each during July, August and September. Approximately 5 percent of the first generation, 50 percent of the second generation and 95 percent of the third generation enter diapause and overwinter in the fifth instar. The primary host is the Douglas-fir beetle.

Parasite behavior during emergence and mating, searching and oviposition, larval feeding and cocoon formation is described.

Laboratory and field studies have led to the following conclusions: females prefer to oviposit under reduced light conditions; hosts are probably located by the vibrations produced rather than by odor; females kept at 75°F.

are ready to deposit at least some eggs on the second day after emergence; peak egg production occurs about the fourth day although ovulation may continue until death; females must feed if maximum egg production is to be realized; females exposed to a 16-hour day at 75°F. and fed a honey and yeast diet laid eggs resulting in an average of 21 cocoons per female; female longevity is approximately twice male longevity, and is greater for both at 60°F. than at any other temperature up to and including 90°F.; only the larval stage of its hosts is parasitized; the insect has a facultative diapause controlled primarily by photoperiod; although diapause intervenes in the fifth instar there is evidence that the critical stage is the adult female before egg deposition; the size of the parasite is correlated with that of its host; fertilized eggs are laid more frequently on large hosts than unfertilized eggs, and vice versa; the temperature optimum for development and the average duration for each stadium at this temperature is: egg, 95°F., 21 hours; first instar, 88°F., 21 hours; second instar, 85°F., 15.5 hours; third instar, 85°F., 12 hours; fourth instar, 85°F., 17 hours; fifth instar (non-diapause), 80°F., 125 hours; pupa, 82°F., 117 hours; no important hyperparasites were found, although predation by Medetera sp. is significant; parasitism of the Douglas-fir beetle ranges up to 100 percent for individual invasions under certain described conditions.

Control recommendations for the Douglas-fir beetle involving C. brunneri are given. Parasite populations should be fostered in the field by felling small diameter trees during June and leaving them in the woods until at least mid-July of the following year. This operation could be integrated with thinning operations. Rapid milling of large diameter trees should continue.

A description of the external morphology of all immature stages if given. The embryological development is traced in detail starting with early cleavage and blastoderm formation, including gastrulation, segmentation and formation of the organ systems.

Microfilm $2.75; Xerox $8.40. 184 pages.

ELECTRONMICROSCOPY AND CYTOCHEMISTRY OF SPERMATOGENESIS AND FERTILIZATION IN THE RAT AND HAMSTER

(Order No. 61-3174)

Daniel Gabriel Szollosi, Ph.D.
The University of Wisconsin, 1961

Supervisor: Professor Hans Ris

Studies on spermiogenesis in invertebrates have demonstrated characteristic changes in the ultrastructure of the nucleus which are related to modifications in chemical composition. The histones are replaced in late spermatids with a more basic protein of higher arginine content. At the same time, the 100 A fibrils fall apart into two 40 A subunits which later condense into the homogeneous compact sperm nucleus. These results raised the question what goes on in the fertilized egg when the sperm nucleus develops into a pronucleus. The present study was undertaken to answer this question.

The eggs of the rat and hamster were chosen because they are comparatively small and do not contain yolk and 10 - 14 eggs are ovulated at one time and are available the year round. Furthermore, sperm penetration and the early developmental stages can be timed accurately under controlled environmental conditions.

Spermiogenesis in mammals has not been examined thoroughly, either by electron microscopy or cytochemically. Therefore, we also have to look at the maturation of spermatozoa in both rodents. The structural and chemical changes in the spermatids of these mammals were found to be, in general, similar to those described for invertebrates. In the young spermatid nucleus coiled 100 A thick chromosome fibrils are present and more or less evenly dispersed. In the rat they show occasionally two closely packed subunits. During the elongation phase of the nucleus, the chromatin becomes diffuse, apparently due to the separation of the 100 A fibrils into their 40 A components. These fibrils fuse later into thicker complexes and at this time the histones are replaced by a basic protein with higher arginine content which seems to be an intermediate between histones and protamines. After penetration these structural and chemical changes are reversed. When the sperm nucleus swells the chromosome fibrils are unraveled. Aggregates of 40 A fibrils and free 40 A fibrils become visible. The 40 A fibrils, however, are seen for a short time only. As the spherical pronucleus is formed they associate again to give 100 A fibrils. Together with this reorganization of the structural components the protamine-like proteins of the sperm head are replaced by histones.

The chromosome fibrils of the egg nucleus measure 100 A in diameter, though occasionally it is clear that the fibrils are composed of two 40 A subunits, closely packed together. Histones are always associated with the DNA of the egg nucleus.

The pronuclei throughout their later development contain typical 100 A fibrils and the DNA is combined with typical histones.

DNA synthesis occurs in young pronuclei. We examined the chromosome fibrils in this period but could not detect any difference from interphase nuclei.

Primary nucleoli are found in the young pronuclei before the nuclear membrane forms. They coalesce and form a large, centrally located nucleolus. The nucleoli are composed of fibrils of similar dimensions as those of the chromosomes. Later, secondary nucleoli with a similar structure appear. Often secondary nucleoli are attached to the nuclear membrane. Many of these smaller nucleoli are apparently extruded into the cytoplasm.

We found three eggs shortly after sperm penetration. The penetrating sperm is covered by a cell membrane only towards the zona pellucida but no membrane is visible towards the vitellus. The plasma membrane of the egg apparently fuses with the plasma membrane of the sperm. This suggests a new hypothesis for the mechanism of sperm penetration. After the sperm has come to lie on the plasma membrane of the egg, the egg and sperm membranes rupture and fuse to form a continuous cell membrane over the egg and the surface of the sperm. As a result, the sperm lies now inside the vitellus leaving its own cell membrane on the egg surface incorporated into the egg membrane.

Microfilm $3.25; Xerox $11.25. 250 pages.

THE GOLDEN-MANTLED GROUND SQUIRREL, CITELLUS LATERALIS CHRYSODEIRUS (MERRIAM), ITS SOCIAL AND COMMUNITY INTERACTIONS.

(Order No. 61-3941)

John Harold Wirtz, Ph.D.
Oregon State University, 1961

Major Professor: Kenneth Gordon

This study of the golden-mantled ground squirrel, Citellus lateralis chrysodeirus, is based on two summers of field work at Crater Lake National Park, Klamath County, Oregon.

Data were obtained by live trapping and observation of marked animals, and experimental procedures.

Juvenile mantled ground squirrels left the nest around the middle of July. At first they moved short distances of only two or three feet from the burrow opening, but within two or three days the young animals were observed 50 feet or more from the nest site. Although the young indulged in a variety of activities, no pattern of a social hierarchy was observed.

In adult mantled ground squirrels, social dominance was well established. The chase order, however, was a group arrangement rather than a straight-line relationship. Occasionally during a chase, the chased animal stopped and after having assumed a chin on the ground position all agonistic behavior ceased. This display was interpreted as an appeasement attitude. The underlying motivation for foot stamping, and the rubbing of the chin on the ground was interpreted as a form of displacement behavior.

The retinas of the mantled ground squirrels are of the pure cone type. Data from experiments to determine the presence or absence of color vision were inconclusive, although there were 66.5 percent correct responses to the relevant stimulus. Odor and the direction of approach to the experimental units appeared to be important factors for the high number of correct responses.

There were approximately equal numbers of males and females both seasons. During July, juvenile males were on an average 5.2 grams heavier than females. By the middle of August, juvenile females averaged 10.2 grams more than males. The average weight for adult males for the two seasons was 163.8 grams, and for adult females the average weight was 157.0 grams. The rate of weight increase varied considerably, ranging from a low of 10 grams in 24 days for an adult male, to a high of 45 grams in eight days for a juvenile female.

Five tunnels were excavated, the longest was 71 feet 4 inches long, and the shortest was seven feet long. No food caches were found.

A captive ground squirrel, kept in the house, hibernated during the winter months. Hibernation is not as deep as in some other animals, for ground squirrels were frequently seen on sunny days in December.

Mantled ground squirrels were observed eating hypogeous fungi, Pinus contorta seeds, the fruits of Arctostaphylos patula, Ceanothus velutina, and Carex inops, as well as, leaves and stems of various herbs and grasses. There was no evidence that ground squirrels were responsible for seedling destruction.

Golden-mantled ground squirrels were observed to travel as much as 1,200 feet between their burrows and a food supply. Animals returned to the area after having been transferred 2.5 miles from their home site.

Preliminary investigations were begun in the use of the tranquilizing agent, Promazine, as an aid in following mantled ground squirrels. The most satisfactory dosage was one cubic centimeter per 100 grams of body weight of a nine to one dilution. Approximately 1.5 hours after the injection, the animals resumed normal activity, but moved in a more leisurely manner.

Various attitudes assumed during the course of the mantled ground squirrels' daily round of activity were photographed and described.

Although the golden-mantled ground squirrel, Citellus lateralis chrysodeirus, and the chipmunks, Eutamias amoenus and E. townsendii have similar food and habitat requirements, there was no evidence of competition between the animals.

Microfilm $2.75; Xerox $6.80. 144 pages.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. Please order copies by number.

MONOGRAPHS

RESEARCH REPORTS SUBMITTED
TO THE UNITED STATES OFFICE OF HEALTH,
EDUCATION, AND WELFARE, OFFICE OF EDUCATION,
UNDER TITLE VII OF THE NATIONAL DEFENSE
EDUCATION ACT OF 1958 (PL 85-864).

AN EXPERIMENT TO DETERMINE THE VALUES OF USING AMPLIFIED CLASSROOM TELEPHONE INTERVIEWS WITH SIGNIFICANT INDIVIDUALS TO ENRICH CERTAIN COLLEGE COURSES: AN EXPERIMENT WITH A NEW MEDIA.

(Order No. 61-3612)

James A. Burkhart
(Stephens College,
Columbia, Missouri, n.d. Project 250)

Purpose:

To determine whether amplified-telephone interviews with significant people could enrich college courses.

Procedure:

Method: One section from each of four college courses (American Government, Principles and Problems in Modern Business, Basic Beliefs, and Masterpieces of World Literature) was taught by "regular methods," but with the addition of a bi-weekly telephone interview with some significant national figure or eminent authority, which was amplified for listening by the entire class. Students were usually encouraged to do supplementary reading to broaden their understanding of the subject. Two interview procedures were used: (1) after a short warm-up of the interviewee by the instructor, the main interview was conducted by students, or (2) the instructor conducted most of the interview with student questions occupying a shorter length of time. The control section in each course was conducted in the same manner with the exception of the interviews.

Statistics. Results were analyzed by chi-square.

Subjects. Subjects were lower division college women. Although the experimental sections were stated to be "balanced" with the control section, no data were included on how this was done. Neither was there information on the control of the instructor variable. In the American Government experimental group 29 students took the attitude pre-test and 19 the post-test; and 28 the knowledge pre-test and 19 the post-test. The control group had 26 in the attitude pre-test and 15 in the post-test; and 26 in the knowledge pre-test and 16 in the post-test. No numbers were reported for the other three courses.

Test Measures. (1) A "knowledge test" over the content was "devised the the instructors to evaluate content competency." No information on its design or validation is presented. (2) The American Council on Education "Inventory of Beliefs" test was used to determine student attitudes. (3) A series of informal interviews with students was conducted to determine student responses to the telephone interview technique. (4) Each instructor completed a teacher evaluation form for each interview. In the American Government course, both the knowledge test and the attitude measure were administered in the Fall of 1959 as a pre-test and again in May 1960 as a post-test. Only the post-tests were administered in the Masterpieces of World Literature and the Introduction to Business courses. No indication of any testing is included for the Basic Beliefs course. The author states that the teachers ". . . were not provided adequate time to develop instruments nor methods for obtaining test information. In view of this, the testing was somewhat less than satisfactory."

Results and Conclusions:

(1) In the American Government course, the experimental telephone interview group made significantly higher scores with respect to the acquisition of knowledge than did the control group. (2) On the basis of only the knowledge post-test scores, no significant differences were found between the two groups in the Masterpieces of World Literature course. (3) No significant differences were found between the experimental and control groups with respect to the "Inventory of Beliefs" test. (4) No test results were presented for the Basic Beliefs course nor for the "knowledge" test in the Introduction to Business course. (5) Student reaction to the telephone interview technique was highly favorable. (6) In general the four teachers were pleased with their experiences in using the amplified classroom telephone as a teaching resource, but felt that it required more careful preparation, more personal involvement, considerable additional administrative work, and greater skill in execution than was normally the case. Microfilm $2.75; Xerox $3.00. 46 pages.

A COMPARATIVE STUDY OF THE EFFECTIVENESS OF THREE TECHNIQUES OF FILM UTILIZATION IN TEACHING A SELECTED GROUP OF EDUCABLE MENTALLY RETARDED CHILDREN ENROLLED IN PUBLIC SCHOOLS IN LOUISIANA

(Order No. 61-3620)

Lamore J. Carter, Roy B. Moss, and Mamie T. Wilson
(Grambling College of Louisiana,
Grambling, Louisiana, n.d. Project 272)

Purpose:

To determine the effectiveness of three experimental film techniques varying in regard to learner participation required and a conventional teaching method in the instruction of educable mental retardates.

The items following each abstract are: the price of a microfilm copy; the price of a copy enlarged by the Xerox process to 6 x 8½ inches; the number of pages in the manuscript. **Please order copies by number.**

Procedure:

Method. Seven short films of children involved in learning a study unit entitled "Health and Safety" were produced with the following three different sound tracks: (1) narration was by a recorded voice synchronized with film action and pointing up facts, principles, and behavioral changes for the pupils to learn; (2) unnarrated, but with recorded voices of children synchronized with the action; and (3) unnarrated and with no recorded sound, but in which the pupils were taught to attempt to direct the actions of persons and situations in the film by loud, frequent, unrestrained verbalizations of approval, warning, sympathy, ridicule, etc. A control group was taught the same information in the conventional manner without film. Each film was shown two days consecutively over a three-week period. The experimental design utilized the pre-test, post-test method.

Subjects. The experimental group consisted of 104 from 20 special classes of educable mentally-retarded children in public schools. The mental age of 65 months was selected as the separation between "high-grade" and "low-grade" mental retardates. Attempts were made to equalize the groups by quality of teaching and school and classroom facilities.

Statistics. Analysis of covariance was used for testing the differences between groups.

Test Measures. The effectiveness of the instructional methods was measured by differences between learning scores on pre-test and post-test forms of A Picture Test on Health and Safety designed by the principal investigators. This was a non-verbal recognition test designed to assess health and safety information and administered by use of 40 sets of four camera snapshots, each depicting "good" and "poor" health and safety practices among children.

Results and Conclusions:

There were no differences in the achievement of the educable retardates in health and safety whether they were taught by one of the three experimental film techniques or by the regular classroom procedure. Neither did mental age status influence the achievement of facts and principles by any one of the four methods. The investigators attribute absence of superiority predicted for the film technique that required overt participation by the audience to the fact that, among retardates, "a given pupil was impeded in gaining new insight by the competing tendency to notice other pupils and what they sensed and were responding to."

Microfilm $2.75; Xerox $4.20. 79 pages.

EXPERIMENTATION IN THE ADAPTATION OF THE OVERHEAD PROJECTOR UTILIZING 200 TRANSPARENCIES AND 800 OVERLAYS IN TEACHING ENGINEERING DESCRIPTIVE GEOMETRY CURRICULA

(Order No. 61-3610)

Clayton W. Chance
(The University of Texas,
Austin, Texas, August, 1960. Project 243)

Purpose:

To compare the instructional effectiveness of university engineering classes taught by projected overhead transparencies with those taught by the use of the chalkboard.

Procedure:

Method. A semester course in engineering drawing was taught to four randomly organized classes of university students by two instructors using the following methods: (1) projected overhead color transparencies specially prepared for the course, and (2) chalkboard drawings rendered on the chalkboard by the instructor. Each instructor taught one transparency class and one chalkboard class. A testing after treatment only design was used.

Statistics. Analysis of covariance was employed for testing the differences in achievement between the two groups.

Subjects. The experimental sample comprised 104 second semester freshmen engineering students in the University of Texas. They were assigned to four separate classes on the basis of a student questionnaire and the Space Relations 30-Minute Differential Aptitude Test.

Test Measures. The Space Relations test was administered both as a pre- and post-test. Student achievement was determined on the basis of their 107 daily drawings, five quizzes, and the final examination.

Results and Conclusions:

(1) It was determined that approximately 15 minutes per 60-minute class lecture could be saved by the transparency media over a comparable blackboard lecture. (2) Although there were no significant differences in the daily drawing grades and the five quiz grades between the two groups, there was a consistent superiority in favor of the transparency group. (3) The final examination grade and the final course grade for the transparency group was significantly superior to the chalkboard group. Of the total number of students that made an "A" in the course, 64 percent were in the transparency group; of the total number that made an "F" in the course, 75 percent were in the blackboard group. (4) Of the total number of questions asked in the lectures, 70 percent were in the transparency group. (5) Both instructors favored the transparency method of teaching over the chalkboard method.

Microfilm $2.75; Xerox $3.00. 51 pages.

A COMPARATIVE EVALUATION OF TWO MODERN METHODS FOR TEACHING A SPOKEN LANGUAGE

(Order No. 61-3622)

A. E. Creore and Victor E. Hanzeli
(University of Washington, Seattle: Department of Romance Languages and Literature, 1960. Project 108)

Purpose:

To compare the effectiveness of an "audio-visual" method with a "conventional" method of teaching basic college conversational French.

Procedure:

Method. The "audio-visual" method was based on the Borglum, Salvors, and Muller text, Images de France: An Audio-Visual Course in Beginning French, and consisted of a set of 35mm color slides integrated with the text lessons, a Teacher's Guide, a pre-recorded magnetic tape for each lesson for listening in the language laboratory, and several supplementary textual materials. The "conventional" method used the Harris and Leneque text, Basic Conversational French, supplemented by readers, a set of integrated pre-recorded tapes for use in the language laboratory, and nine locally-recorded tapes. With the audio-visual method, the slides were used to introduce each lesson, then again for pattern drill, and finally, during another period, for review. Four 20 to 25-minute laboratory periods were held per week. With the conventional method, the audio-lingual approach was emphasized as extensively as with the experimental method, but dialogues were used instead of the visual slide material, and some of the exercises included translation. The control students attended the language laboratory for the same amount of time as the audio-visual group. It was impossible to rotate the faculty between the experimental and control groups.

Statistics. The data were analyzed using standard statistical measures obtained from C. E. Wright's Symmetric Correlation Matrix Program for the IBM Type 650.

Subjects. The subjects were drawn from freshman university classes at the beginning and end of the second quarter (of three quarters) of instruction. Students enrolled in these classes without previous knowledge of the method to be used in any particular section. The major conclusions were based primarily on 55 audio-visual group students and 40 control students. The two groups showed no significant differences on any co-variates selected to analyze their homogeneity.

Testing Measures. Students were tested at the beginning and end of the second quarter for (1) skill of understanding French when spoken, (2) speaking ability, and (3) achievement in writing and reading. Questionnaire surveys were conducted to determine student attitudes, appreciations, and motivations. Teacher attitudes were measured by a questionnaire administered to about 75 teachers familiar with Images de France throughout the country.

Results and Conclusions:

(1) The greatest advantage for the experimental audio-visual method was its efficiency in teaching the speaking skill, the scores of 55.5 to 42.4 being strongly significant. (2) In the reading skill, however, the experimental method was significantly inferior, 19.3 to 23.6. This inferiority also existed in comparison with national objective test standards. (3) In the writing skill, the experimental method was also significantly inferior, 45.5 to 55.6, the inferiority existing also in comparison with national objective test standards. (4) Significantly less "transfer" from English to French seems to have taken place in the audio-visual group than in the control group, students' knowledge of English playing a slighter role in their acquisition of French by the experimental group. (5) There were no apparent relationships between achievement and rating of instruction, student prediction of their own achievement, or their evaluation of the course, language laboratory, and the importance of foreign language skills. (6) The audio-visual approach showed a consistent, but non-significant, motivational effect in the tendency to continue the study of French. (7) The general conclusions from that study was that the college teacher who tries to achieve a balanced progress in all four language skills during the first year of study would find the audio-visual method (as organized in this study) inferior to the conventional method.

Microfilm $2.75; Xerox $4.20. 80 pages.

"WHEN IS SEPTEMBER?" AN EXPERIMENT IN THE PROVISION OF PRE SCHOOL EXPERIENCES VIA EDUCATIONAL TELEVISION TO ORIENT AND MOTIVATE CHILDREN ENTERING GRADE ONE AND TO FACILITATE THEIR ADJUSTMENT TO GROUP ACTIVITIES.

(Order No. 61-3618)

Walter N. Durost
(Pinellas County Board of Public Instruction, Clearwater, Florida, 1960. Project 120)

Purpose:

To study the effectiveness of a series of pre-recorded and live TV programs in orienting pre-school children for first grade by acquainting the child with the school environment, encouraging proficiency in certain basic skills, and orienting the parent to their expectancies and responsibilities.

Procedure:

Method. Twenty one-hour telecasts were presented over a commercial television station during the month prior to the opening of the school year. The first half-hour of each program was designed for child- and parent-viewing, the second half for parent alone. Evaluation of program effectiveness was made by parent and teacher questionnaires, parent interviews, and student achievement.

Subjects. Major analysis of the program effectiveness was made with a group of 42 parents who had viewed at least half of the programs. The children in this group were matched as closely as possible with a control group of non-TV participants on the basis of race, sex, school, age, and socio-economic status.

Statistics. Critical ratios on the three standardized tests were determined for the total population vs. the control group, total population vs. the experimental group, and experimental vs. the control group.

Test Measures. The achievement test measures used were the Metropolitan Readiness Test, Pintner-Cunningham General Ability Test, and the Metropolitan Achievement Test. Questionnaire surveys were made of parent and teacher behavior and reactions to the programs. Parents were interviewed.

Results and Conclusions:

(1) Although the author raises a reservation about the randomness of the samples used to evaluate the effectiveness of the telecasts, he points out that "the consistency of the differences argue for the assumption that the television experience has had a real effect on improving the test performance of the experimental group as compared to the control group." (2) The first grade teachers felt that the television programs had a positive effect upon the viewers. (3) Parent reaction to the programs was generally favorable.

Microfilm $2.75; Xerox $7.40. 160 pages.

THE ROLE OF REVIEW MATERIAL IN CONTINUOUS PROGRAMMING WITH TEACHING MACHINES

(Order No. 61-3611)

C. B. Ferster
(Indiana University Medical School, n.d. Project 355)

Purpose:

To evaluate whether repetition of the program material in the self-instructional devices contributed to the mastery of the material.

Procedure:

Method. The 61 lessons of the first revision of the Holland-Skinner psychology course were presented to the students in semiautomatic teaching machines which were kept on a reserve basis in the Medical School Library. The students could use the machines in the library or take them home. Lessons 22 and 37 of the program were test lessons designed to test the mastery of the immediately preceding materials. These tests were given in the library under controlled conditions, unlike the remainder of the materials which could be completed any place. When a lesson was to be repeated, a second copy of the lessons was pasted on at the end of the lesson, so that the student repeated the lesson simply by continuing to operate the machine. Half of the students studied Lessons 1-22 with only a single repetition, and half without repetition. The conditions were then reversed for Lessons 23-36 and again between Lessons 38 and 60.

Subjects. The subjects were 49 students of the author's section of the freshmen psychiatry course at Indiana University.

Statistics. Means and standard deviations of numbers of teaching-lesson errors and scores on the final examination were presented, but no indication of the statistic used to determine statistical significance was reported.

Test Measures. The 60-minute final examination consisted of 86 items taken from the teaching tapes. The questions were presented in irregular order and selected so as to cover the content of the course. The students were given assurance that they would not be graded on the teaching-machine results, but only on the final examination.

Results and Conclusions:

"The results of these experiments give no evidence that simple repetition of the teaching lessons aided in their mastery. The tests which were given after portions of the teaching lessons that were repeated showed no higher level of performance than those that were not repeated. Students reported that they could essentially memorize the answers when they took the lessons the first time, and that the repetition did not constitute as much of a review as it might have had the material been different. Undoubtedly, a much better form of repetition is the kind already built into the teaching lessons, in which the student is given review of the basic concepts by a variety of examples which test the relevant concepts."

Microfilm $2.75; Xerox $3.00. 5 pages.

TESTING THE EFFECTIVENESS OF TWO-PURPOSE TELEVISION PROGRAMS IN CONTRIBUTING TO BOTH TEACHER AND PUPIL LEARNING (ELEMENTARY SCIENCE)

(Order No. 61-3623)

Alexander Frazier and Lewis D. Evans
(The Ohio State University Research Foundation, Columbus, Ohio, December 27, 1960. Project 298)

Purpose:

To explore the effectiveness of two-purpose television programs in contributing to increased teacher understanding of elementary science and stimulating pupil activity in this field.

Procedure:

Method. Ten half-hour telecasts were prepared on elementary science topics approved by 151 teachers of third- and fourth-grade classes. These telecasts were

sent to classrooms at two-week intervals. Effects of the telecasts were evaluated in a variety of ways in order to determine their value in affecting teacher and pupil behavior.

Subjects. Participating in the study were 151 teachers and 4814 third- and fourth-grade pupils. The group comprised volunteers from all of the third- and fourth-grade teachers in Columbus and the adjoining county schools. This group attended an orientation session at University School prior to the series, at which time they were administered an attitude measure, saw a sample kinescope, were told the purposes of the study, and received copies of the study guide and the evaluation instrument.

Statistics. Results were evaluated by means of rating scales and questionnaires.

Test Measures. Six measures were used: (1) an attitude questionnaire given to teachers before the project started and again at the close; (2) Sequential Tests of Education Progress (Cooperative Testing Service) given to fourth-graders to measure aspects of thinking and the ability to use science information in situational problems; (3) individual program evaluations by teachers; (4) final teacher evaluation of the series as a whole; (5) principal and supervisor reactions; and (6) personal interviews with 20 teachers selected at random.

Results and Conclusions:

(1) Teachers increased significantly in their feeling of competence in handling science in the elementary classroom, the greatest increase being in the physical sciences area. (2) Teachers professed a willingness to accept such consultant service via television in other areas as in elementary science, there being no overt expression of resistance to the idea of being educated along with their children. (3) Teachers evaluated all the programs as being high in pupil interest and observed significant growth in pupil problem-solving behavior, increased home interest in science activities, materials brought to class, and increased breadth and range of questions asked by children. (4) Pupil growth in achievement as measured by the standardized test selected for use with fourth-grade pupils was not significant nor was any attempt made to compare the growth of the experimental groups with control groups.

Microfilm $2.75; Xerox $4.40. 84 pages.

REPORT OF RESEARCH ON THE INTEGRATION OF SCIENCE TEACHING BY TELEVISION INTO THE ELEMENTARY SCHOOL PROGRAM

(Order No. 61-3616)

Ralph J. Garry
(Boston University, Boston, Massachusetts,
October 31, 1960. Project 031)

Purpose:

To study the effects of teaching training, method of presentation of program, teaching method, and pupil activity upon the achievement, interests, attitudes, and scientific reasoning ability of fifth grade pupils studying natural science by television.

Procedure:

Method. Ninety classes of fifth-graders viewed a series of 30 half-hour natural science programs produced by the Massachusetts Audubon Society and designed to develop understanding of the relationship of all living things to their environment. Eighteen control classes received the televised instruction with no additional related instruction. The 72 experimental classes received the televised instruction under the following combination of conditions: (1) TV instruction used to initiate a unit of study vs. to terminate the unit; (2) teacher use of an extensive study guide vs. no study guide; (3) presentation of common assignments to all class members vs. encouragement of pupils to work on individual projects; (4) teachers who obtained workshop training in science vs. workshop training in utilization of TV vs. no special training. Thus, each of the experimental classes was operating under some combination of each of the four experimental conditions. Testing was before and after the treatment.

Subjects. About 2600 fifth-graders in 90 classes randomly drawn from 300 fifth grade classes in 30 cooperating communities of urban, suburban, and semi-rural composition within a 50-mile radius of Boston.

Statistics. Analysis of variance was used in treatment of the data.

Test Measures. Measurement of effects was made by specially-constructed tests on science information, science vocabulary, standardized science achievement, science reasoning, interest inventory, activity check list, TV viewing check list, and an attitude scale.

Results and Conclusions:

(1) Large, statistically significant differences were obtained in favor of the experimental classes over the control classes in science information and vocabulary achievement. (2) No significant differences were found between the experimental and control groups in scientific reasoning ability or interest in science. (3) None of the man experimental effects produced statistically significant differences between classes within the experimental group.

(4) Teacher training in a specific subject would have to be more intensive than that provided in workshops established for this study to be translated into significant differences in pupil achievement. (5) If TV programs are to be used as a terminal activity, greater learning occurs where the class assignments are made by the teacher and are common to all; where TV is used to initiate a program, the optimum combination to be used in follow-up activity is individual projects or assignments. (6) Teachers with a brief outline and suggestions for pupil projects achieved as much with their classes as teachers with a comprehensive study guide. (7) Pupil attitudes toward science and toward scientists do not change readily. (8) Children of high initial interest and children of high intelligence tended to lose interest as the school year progressed, the more intensive the school work, the greater the loss. Two explanations were advanced for this finding: one is that the initial high interest was not based on reality and that direct experience produced a more realistic experience measure in most children; the other explanation is that for children who possess an established interest, making it a phase of school work tends to kill it. (9) Variations in skill among teachers yielded considerable differences in learning, suggesting that the quality of teaching is primary rather than the amount of time given to science. (10) The concluding suggestion is made that "while we may be effective in providing for conventional academic achievement, we have much to learn about creating an educational climate which provides for specific changes in interest, attitude, and science reasoning."

Microfilm $2.75; Xerox $4.40. 85 pages.

A STUDY OF CLOSED-CIRCUIT TELEVISION AS A TEACHING TECHNIQUE FOR SPEECH IMPROVEMENT IN THE PUBLIC SCHOOL SYSTEM

(Order No. 61-3621)

Sara M. Ivey and Norman DeMarco
(University of Arkansas,
Department of Speech and Dramatic Art,
Fayetteville, Arkansas, January 1961. Project 278)

Purpose:

To test the effectiveness of closed-circuit TV instruction as inservice training for elementary classroom teachers and to test the amount of speech improvement achieved with the third grade children through 52 closed-circuit TV programs presented for one year.

Procedure:

Method. A year-long series of 52 closed-circuit telecasts, each 20 minutes in length and presented twice weekly, on training in the fundamental oral communication skills designed to create an awareness of the importance of speech and to provide specific training in vocal, articulatory, and listening skills, was presented to the experimental group. A matched control group received no training in speech improvement. The experimental design utilized the pre-test, post-test method. The telecasts were specially prepared for the experiment and wise use of puppets, audiovisual materials, and dramatization.

Subjects. Ten classes, consisting of 220 third grade children served as subjects, one experimental and one control class in each of five schools. A table of random numbers was used to equalize the class sizes in each school.

Statistics. Analysis of covariance was used for testing the differences between the groups. When the covariance analysis showed a significant difference among schools or groups, a t test was used to determine where these significant differences were.

Test Measures. A battery of 11 tests was used to evaluate the processes involved in using speech sounds, listening, recalling, discriminating among speech sounds, reading, language comprehension, intelligence, and the personality of the talker. Tapes were made of each child's articulation, reading, and spontaneous speech.

Results and Conclusions:

Although both experimental and control groups improved in speech performance during the year, the television group improvement was not significantly superior to that of the control group. The findings seem to indicate that closed-circuit TV, as presented in this study, was not an effective medium for teaching speech improvement in the third grade. Nor was TV instruction effective as inservice training for elementary classroom teachers.

Microfilm $2.75; Xerox $4.60. 89 pages.

A COMPARATIVE STUDY ON THE EFFECTIVENESS OF THE FILMSTRIP, SOUND FILMSTRIP, AND FILMOGRAPH FOR TEACHING FACTS AND CONCEPTS.

(Order No. 61-3615)

Ronald J. McBeath
(University of Southern California, Department of Audio-Visual Education, Los Angeles, California,
February 15, 1961. Project 462)

Purpose:

To compare the relative effectiveness of four filmic methods of presenting facts and concepts.

Procedure:

Method. A sixth grade social studies lesson was developed around the subject of the exodus of the Maoris from Polynesia, their sea voyage to New Zealand, and their way of life in New Zealand. The content was produced in four alternate versions: as a silent captioned filmstrip, a captioned filmstrip with recorded narration, a sound filmstrip in which the sound track of the filmograph was

duplicated with the addition of an audible tone as a cue to turn to the next frame, and a 16mm sound filmograph. Instructions to the experimental groups were presented as a tape recording. The 30-item pre-test was administered so that students sitting beside each other had different forms of the test. Upon completion of the pre-test, the appropriate film was shown the group followed immediately by the alternate form of the 30-item post-test. Pre- and post-tests were combined into a 60-item retention test administered three weeks later.

Subjects. Twenty sixth-grade classes of 558 students were selected from ten different areas of Los Angeles County. Classes were matched into four groups by IQ, age, sex, and socio-economic status of the father.

Statistics. Analysis of variance and the Tukey test were employed to test the differences among the groups.

Test Measures. A 60-item test of facts and concepts was prepared. A pilot study with 135 comparable children showed the reliability of the test to be .85 using the Kuder-Richardson formula 20. An item analysis enabled the pairing of the questions into two 30-item forms.

Results and Conclusions:

(1) On the immediate and retention tests, no single method was found to be significantly superior or inferior, although the captioned filmstrip with narration showed a slight superiority to the other versions. (2) The boys did significantly better than the girls on both tests. (3) Students with high intelligence did significantly better on both tests than did those with lower intelligence. (4) On the immediate test, the interaction between sex and methods was statistically significant. The highest gains were scored by boys who saw the captioned filmstrip with narration; the lowest gains by girls who saw the filmograph.

Microfilm $2.75; Xerox $3.00. 29 pages.

UNDERSTANDING NEW MEDIA

(Order No. 61-3619)

H. Marshall McLuhan
(National Association of Educational Broadcasters, Urbana, Illinois, June 1960. Project 279)

Purpose:

In a syllabus usable in secondary schools, to "explain the character of a dozen media, illustrating the dynamic symmetries of their operation on man and society."

Procedure:

The author made a number of visitations with educators, communication specialists, management consultants, psychologists, and sociologists in order to gain insight into the problem. Three "media experiments" were reported bearing on the hypotheses set forth in the study. The written report centers upon a number of charts of different communication media, describing each in terms of: Low Definition (wherein there is a low degree of information provided for the sense in question, such as in television or the telephone), High Definition (wherein there is a high degree of information provided, such as film or radio), Structural Impact (which refers to the sensory impressions as they affect the beholder or audience), and Subjective Completion (which concerns the effect of this impression as it is processed by the audience). The report is in part to be taken with Gutenberg Galaxy, a half-hour film which was made along with it.

Conclusions:

Before anybody in the Western world can approach any medium, it is necessary for him to be fully aware of the shaping forms and consequences in the sensuous and mental lives of all who are exposed to the phonetic alphabet, written or printed. Understanding Media postulates the basic hypothesis that any means of codification of experience in terms of any sense whatever inevitably transforms the ratio among the other senses and thereby alters patterns of thought, feeling, and action. Once an external means of codification exists, it becomes not only a translator of experience, but a means of translating one sense into another sense. Languages are the first media. They are the lowest in definition of all media, requiring more participation and active "closure" on the part of hearer and speaker alike than any other medium. The concept of closure or completion is basic in understanding media, since it becomes possible to see why no sense can operate in isolation from all the others and no medium can exist by itself. The medium determines the modes of perception and the matrix of assumptions within which objectives are set: that is, "the medium is the message." Not only is the medium the message, but "information" or "content" of any medium is always another medium. It still becomes necessary to understand any medium in all its levels and manifestations in order to have any critical awareness of "message." Thus the medium of radio may contain the medium of speech or of music, but the effect of radio in stepping up the ear component in the human sense ratio is quite independent of the speech or music "program" factor. Media qua media are total systems, but not closed systems. They can be modified by the coexistence of other media. Television appears as a primarily tactile rather than visual medium. All the recommendations can be reduced to this one: "Study the modes of the media, in order to hoick all assumptions out of the subliminal, non-verbal real for scrutiny and for prediction and control of human purposes."

Microfilm $3.65; Xerox $12.85. 281 pages.

AUDIO-VISUAL AIDS FOR STUDENT COUNCIL EDUCATION

(Order No. 61-3614)

Frank R. Paine
(The University of Mississippi,
Oxford, Mississippi, n.d. Project 375)

Purpose:

To discover, through a survey of schools with outstanding student governments, the audiovisual materials which appear most effective in creating and maintaining good student government, their utilization, and the new materials needed.

Procedure:

Method. Eighteen high and junior high schools were selected to represent the major sections of the country, sizes and levels of schools, and different socio-economic classifications. Data were gathered by means of interviews with students, student government advisors, teachers, student council officials, and audiovisual specialists. Interviews were tape-recorded.

Subjects. High school and junior high school students and educators involved in student council activities. The 18 participating schools were selected from 150 schools having outstanding student councils in order to represent the major sections of the country, a variety of sizes and levels of schools, and various socio-economic classifications.

Statistics. Summary and analysis of interview data.

Test Measures. Recorded interviews on four standardized forms constructed to elicit information from the following groups: state executive secretaries, audiovisual directors, student council leaders, and student council sponsors.

Results and Conclusions:

(1) In the opinions of educators and student leaders interviewed, good audiovisual materials can accelerate, extend, and enrich student council education. (2) The weakest aspect of student council education is the lack of up-to-date high quality audiovisual materials related directly to its present needs. (3) Educators and student leaders expressed their eagerness to receive and make use of effective new films and filmstrips. (4) To fill the need, some student councils made their own amateur films. (5) Existing motion pictures dealing with citizenship education and youth problems were found to be in an extremely low state of utilization. (6) The research staff concluded that the greatest single cause of non-utilization of available films was the fact that they had never been catalogued and evaluated in a publication that related them to the needs of student council education. (7) Evidence from leading commercial educational film producers indicates that no work is in progress on films for student council education. (8) The staff formulated a list of 11 films recommended for production. (9) The most serious and frequent criticisms of the films were: they are too elementary, are written for junior rather than senior high school, show old-fashioned styles, talk down to students, are miscast, and are so unnecessarily dull that modern students resent being required to view them.

Microfilm $2.75; Xerox $7.00. 147 pages.

TAPE RECORDED LECTURES IN THE COLLEGE CLASSROOM: AN EXPERIMENTAL APPRAISAL.

(Order No. 61-3617)

W. James Popham
(Kansas State College of Pittsburg,
Department of Education and Psychology,
August 1960. Project 474)

Purpose:

To determine the effectiveness of teaching a graduate level college course in education research methods with a series of tape recorded lectures.

Procedure:

Method. An eight-week summer session course was taught by two methods: (1) a conventional lecture-discussion approach vs. (2) a series of tape recorded lectures coupled with brief discussions led in person by the lecturer. The enrolled students were divided into two groups matched by three pre-test measures. The control group (conventional mode) met from 2:10 to 3:00 daily; the experimental group (tape recording mode) started at 2:30 and ended at 3:20. This permitted the instructor to teach the control section, then meet with the experimental section at the end of the 30-minute tape recording for the 20-minute discussion period. Lectures were taped only several days in advance so the course content would be comparable in both sections. In all, 34 taped lectures were heard by the experimental classes. The pre-tests were repeated at the end of the class sessions during a two-day period.

Statistics. The t-test was used for testing the differences between the two groups on achievement, and the Mann-Whitney U-Test was employed to test differences between the two groups on students' proposed research plans and differences when students were grouped by ability.

Subjects. Subjects were 55 students enrolled during the 1960 summer session course in Educational Research Methods conducted at Kansas State College of Pittsburg. There were 27 students in the experimental group and 28 in the control group, no significant differences existing between the two groups with respect to the three matching test scores, sex, age, graduate credit, teaching experience, or previous credit (?) in measurement or statistics.

Test Measures. The acquisition of factual information regarding research techniques was measured by

specially-designed 75 multiple-choice test. The ability to make sound interpretations from reported research was measured by a specially-designed 25 multiple-choice test. Students' ability to plan research studies of their own was measured by giving them a brief description of a problem suitable for research analysis and instructing them to describe a research plan appropriate for investigating the problem. Unsigned opinions of the tape recorded lecture technique were solicited from the students during the final test period. The Miller Analogies Test was used to equate the groups by scholastic aptitude.

Results and Conclusions:

(1) No significant differences between the two groups were discerned on the information test, interpretation test, or the two measures combined. (2) No significant differences were observed in the case of the high ability or low ability sub-groups. (3) No significant differences were found between the quality of the research plans prepared by the two groups. (4) In general, student opinions of the taped lecture method were favorable. (5) Many students in the experimental group indicated that the discussion period was extremely important.

Microfilm $2.75; Xerox $3.00. 16 pages.

THE EFFECTIVENESS OF FILMED SCIENCE COURSES IN PUBLIC SECONDARY SCHOOLS

(Order No. 61-3624)

W. James Popham and Joseph M. Sadnavitch
(Kansas State College of Pittsburg,
Department of Education and Psychology,
August 1960. Project 091)

Purpose:

To evaluate the filmed physics and chemistry courses in public secondary schools of southeast Kansas.

Procedure:

Method. Year-long courses in high school physics and chemistry were taught by two methods: (1) using filmed lessons, produced by Encyclopaedia Britannica Films, in which students viewed approximately one 30-minute film per day supplemented by class discussion, and (2) using the conventional non-film classroom teaching approach. A total of 149 physics and 132 chemistry films were viewed during the academic year. The teachers employing the films participated in a one-day workshop prior to the beginning of school to determine classroom procedures and to arrange the film distribution schedule. Student subject matter achievement, interest in physical science, and attitude toward the subject matter were measured at the beginning of the term and again at the end.

Statistics. Analysis of variance was employed to test differences between film and non-film groups with respect to subject matter achievement. Non-parametric tests were used to analyze attitude and interest data.

Subjects. The research sample was drawn from students enrolled in 12 southeast Kansas secondary schools, 6 schools serving for the filmed physics and non-film chemistry instruction and 6 schools for the non-film physics and filmed chemistry. Schools in the two groups were matched according to several school characteristic factors. Of the 312 physics students, 155 were taught by film and 157 in the conventional manner; of the 475 chemistry students, 234 were taught by film and 241 conventionally.

Test Measures. The pre- and post-test measures were: Cooperative Physics Test, Cooperative Chemistry Test, Thurstone Interest Schedule, and A Scale for Measuring Attitudes Toward Any School Subject. Intellectual aptitude was measured by the Otis Quick Scoring Mental Ability Test. Student attitude toward filmed courses in general was measured by specially-designed Attitude Toward Film Courses Scale, and teacher reactions by a specially-designed questionnaire.

Results and Conclusions:

(1) The achievement performance of the non-film group in physics was significantly superior to the film group. (2) There were no significant differences between the two groups in chemistry. (3) There was no significant interaction of teaching method with level of student intelligence for either chemistry or physics. (4) There were no significant differences between the two physics groups in their interest in physical science. (5) The lower ability chemistry film group showed significantly less interest in physical science than the comparable non-film group. (6) Although both groups in physics and chemistry evidenced a more unfavorable attitude toward physics or chemistry as a school subject at the conclusions of the study than they did at the beginning, the film group's attitudes were significantly more unfavorable than those of the non-film group.

Microfilm $2.75; Xerox $4.00. 72 pages.

AN INVESTIGATION OF THE RELATIVE EFFECTIVENESS OF CERTAIN SPECIFIC TV TECHNIQUES ON LEARNING

(Order No. 61-3613)

John C. Schwarzwalder
(U. S. Office of Education, Educational Media Branch,
Washington, D. C., 1960. Project 085)

Purpose:

To consider techniques in the arrangement and presentation of televised material of fifth grade science information in order to discover how best to use TV as an instructional tool.

Procedure:

Method. Three different techniques of television presentation and use were compared: (1) visual continuity arranged for camera shots in a planned order vs. an unplanned random order, (2) visuals reinforced with superimposed verbal materials vs. appearance without such "supered" reinforcement, and (3) visuals manipulated by the teacher similar to regular classroom use vs. visual manipulation resulting from careful planning by the TV director and cameramen. These three techniques were arranged in eight different treatment combinations for the teaching of fifth grade science lessons on plants, mammals, heat, machines, telegraph, wind, ground water, lenses, and longitude and latitude. Each broadcast kinescope lesson was 25 minutes in length, presented over ETV station KTCA-TV at the rate of one lesson per week. The same teacher taught all 72 experimental lessons, the same TV crew was used for production, and the viewing conditions were controlled. The experimental design tested the effects of each of the three techniques by itself and in relation to the other two techniques by itself and in relation to the other two techniques, using testing after treatment only and providing an evaluation of single factors and their interactions in a 2x2x2 factorial design.

Statistics. Analysis of variance was used to analyze the data with a .10 level of significance determined to be a reasonable significance level.

Subjects. The experimental groups were 40 fifth grade classes in the St. Paul Public Schools, selected at random from the 67 available for the study. The order of broadcasting was randomly assigned to these groups.

Test Measures. Tests of about 30 items each were designed for each of the nine lessons after validation on fifth grade students not participating in the study. Tests were given after each TV lesson. The mental ability of each student was measured by the Otis Quick Scoring Mental Ability Test given at the fourth grade level.

Results and Conclusions:

(1) There were 22 differences for the nine science areas found to be statistically significant, all but two of these being at the .05 level. (2) In most instances the highest student achievement resulted from a combination of one technique using the TV team production efforts (planned continuity or supering or TV visuals) and a second technique using only the teacher's efforts (unplanned camera continuity or no supering or classroom visuals). In other words, the TV devices appeared to facilitate the effects of the teacher's efforts. (3) Visual aids developed in cooperation with TV production staffs contributed as much as and in many instances more to student learning than did visuals prepared by the teacher alone. (4) The results suggest that TV-centered techniques such as superimposition in themselves do add materially to student learning, and particularly so in conjunction with other relevant production techniques.

Microfilm $2.75; Xerox $3.00. 56 pages.

HIGH SCHOOL PHYSICS BY TELEVISION: THE HOUSTON AREA PROJECT.

(Order No. 61-3609)

Wallace H. Strevell
(University of Houston, College of Education, Bureau of Education Research and Services, Houston, Texas. September, 1960. Project 306)

Purpose:

(1) To study the effectiveness of TV teaching under varied conditions of school organization and student characteristics such as urban-rural, segregated schools, and homogeneous grouping.

(2) To investigate certain selected administrative and instructional practices.

Procedure:

Method. A year-long physics course was telecast three days a week over the University of Houston TV station, KUHT, to regular high school classes. Instruction during the remaining two days of the week was by the regular classroom teachers. Comparisons were made between (1) TV-taught heterogeneously-grouped and homogeneously-grouped classes, (2) TV-taught and traditionally-taught classes of both groupings, (3) TV-taught classes in city and rural areas, (4) students in segregated white and Negro schools under the above conditions, and (5) a number of student characteristic variables. Various conclusions were drawn from the experience in administering the TV instructional program.

Statistics. Analysis of variance was applied, and significant differences among the means were noted with the F-test and significant differences between the means with the t-test.

Subjects. Although about 1200 students (in 29 independent school districts and 53 physics classes) participated in some phases of the experiment, the final conclusions were based upon 186 full-time TV-taught students and 236 matched students taught in traditional (control) classes. Of these 422 subjects, 160 were Negroes, 262 were white; 152 were in rural schools, 270 in city schools; 192 in homogeneously-grouped classes, and 230 in heterogeneously-grouped classes.

Test Measures. Early in the year students were given the Iowa Physics Aptitude Examination and the Otis Gamma Quick-Scoring Mental Ability Test. At mid-term the Outterson Mid-Term Physics Test was administered. The Dunning Physics Achievement Test was given at the end of the year. All tests were administered to experimental and control groups.

Results and Conclusions.

(1) The TV-taught high school classes achieved equally as well as the traditionally-taught control classes. (2) There was evidence that TV-taught homogeneous

classes were more effective than TV-taught heterogenous classes, making greater gains in achievement in relation to ability and having a more positive attitude toward televised instruction. (3) The TV-taught rural classes made as much progress as the control rural classes. (4) The TV-taught Negro classes made more gains than white classes in terms of original aptitude. "It appears on the whole that television teaching was an advantage for academically underprivileged groups." (5) A favorable teacher attitude toward TV and the project was found to accompany larger gains in student achievement in TV-taught groups. (6) No significant differences in student gain was discovered due to intellectual ability, class size, level of school district expenditures for education, pupil attitude toward TV, quality of laboratory facilities, student prerequisites in science, student load, or the quality and amount of teacher training. (7) Telecast instruction was concluded to be one of the most rapid and effective supervisory means to bring improvement of curriculum content and teaching methods in the schools. It also promises quick results in instituting new course content and sets a standard in careful and accurate preparation of lectures, demonstrations, and other content.

Microfilm $2.75; Xerox $3.00. 38 pages.

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LIBBEY, Leonard Morton. XXII, 1125

LIEBLING, Herman I. XXII, 1049

LIN, Min-Shuey. XXII, 1106

LINDECKER, Wayne Moore, Jr. XXII, 1091

LIPSEY, Robert Edward. XXII, 1034

LIPSIG, Joseph. XXII, 1026

LITTLE, John Frederick. XXII, 1277

LITTLE, Milburn Judson. XXII, 1059

LIU, Teh-yung. XXII, 996

LJUNGLIN, James John. XXII, 1106

LONG, William H. XXII, 1220

LOONEY, John Francis. XXII, 1144

LUYBEN, Helen Louise. XXII, 1180

LYMAN, Frederic A. XXII, 1118

McCARTHY, Adrian James, S.M. XXII, 1181

McCARTHY, Leonard James, S.J. XXII, 1182

MacDONALD, Russell Charles. XXII, 1180

McGEE, Richard Keith. XXII, 1257

MacGREGOR, Thomas Harold. XXII, 1198

McGUFFIE, Helen Louise. XXII, 1182

MACHIN, William Dean. XXII, 1027

MACHO, Thomas, S.J. XXII, 1212

McKELVIE, Neil. XXII, 1016

MAGAZINER, Daniel Edward. XXII, 1255

MAHGOUB, Ali Abdel Aleem. XXII, 1238

MALLEY, Arthur. XXII, 997

MANDEL, Gerald. XXII, 1027

MANOLOPOULOS, Triantaphyllos Philip. XXII, 1016

MANOS, Georgia Evangeline. XXII, 981

MANUEL, Thomas Asbury. XXII, 1003

MARCHIONNE, A.M. XXII, 1256

MARDER, Martin. XXII, 1243

MARIE WILLIAM, Sister
see Hoerner, Marie William, S.P.

MARSHALL, Kevin Charles. XXII, 975

MARTIN, Charles John. XXII, 1198

MARTIN, Clifford K XXII, 960

MARTIN, Horace Feleciano. XXII, 997

MARY FLORENCE, Sister
see Burns, Mary Florence, C.S.J.

MASLOW, Albert R. XXII, 1285

MATSON, Leslie Emmet, Jr. XXII, 1114

MATTHEWS, Kenneth David, Jr. XXII, 1133

MAYEDA, Sengaku. XXII, 1213

MAYEROFF, Milton. XXII, 1213

MAYURNIK, George. XXII, 1107

MELL, Donald Charles, Jr. XXII, 1159

MELONE, Joseph James. XXII, 1050

MENYUK, Paula. XXII, 1059

MERKOW, Leonard Philip. XXII, 1130

MERMIER, Guy René. XXII, 1183

MERTZ, Robert Theodore. XXII, 1199

METZ, Donald S. XXII, 1080

MEYER, Donald Lee. XXII, 1199

MILLER, Barbara Ann Bowens. XXII, 1257

MILLER, Irving. XXII, 1297

MILLER, John Tyler. XXII, 975

MILLER, Richard Allen. XXII, 1017

MILTIMORE, James Earl. XXII, 960

MINOR, Lucian Weld. XXII, 1184

MITCHELL, Irene Eldridge. XXII, 1060

MOCK, William Lindsey. XXII, 1087

MOLOF, Alan Hartley. XXII, 1109

MONTAGNE, Jean Bernard. XXII, 1028

MONTGOMERY, Morris W. XXII, 954

MONTOURE, John Ernest. XXII, 954

MOORE, Harry Scott, Jr. XXII, 1294

MORAN, Edward Francis, Jr. XXII, 1004

MOROS, Stephen A. XXII, 990

MUIR, Donal Ewart. XXII, 1291

MURPHY, Donald Guy. XXII, 1307

MURPHY, Joseph Francis. XXII, 1134

MURPHY, Keith Lawson. XXII, 1110

MYERS, Noel Thomas. XXII, 1071

NALVEN, Fredric Bertram. XXII, 1258

NANJUNDIAH, Hassan Narasimha. XXII, 1101

NAZZARO, James Russell. XXII, 1266

NEELEY, Luther Paden. XXII, 1043

NELSON, James Graham. XXII, 1160

NEMSER, William Joseph. XXII, 1168

NEWMAN, Katharine Dealy. XXII, 1184

NEWMAN, Theodore Joseph. XXII, 1217

NEWSOME, Ratana Suddharatt. XXII, 997

NICOLL, George Douglas. XXII, 1144

NITIDANDHAPRABHAS, Ovart. XXII, 1018

NOFZIGER, James Curran. XXII, 955

NORDSIEK, Frederic William. XXII, 1229

OAKES, Norman Edwin. XXII, 1160

OLSON, Edward Cooper. XXII, 971

OLSON, James Walter. XXII, 988

OMPS, James Ray. XXII, 1043

O'NEILL, Charles Edward. XXII, 1004

OSSESIA, Michel Germain. XXII, 1200

OURECKY, Donald Kenneth. XXII, 960

OWENS, Kenneth Nelson. XXII, 1145

PABST, Donald Froh. XXII, 1044

PACHECO, Guillermo. XXII, 1308

PAGE, Donald Frederick. XXII, 1018

PAN, Coda H.T. XXII, 1101

PANIGOT, Helen Louise. XXII, 1278

PAOLUCCI, Henry. XXII, 1185

PAPA, Anthony Joseph. XXII, 989

PARCHMENT, John Gerald. XXII, 982

PARKER, Aileen Webber. XXII, 1087

PASCHAL, Herbert Richard, Jr. XXII, 1146

PATTERSON, Cecil Lloyd. XXII, 1161

PATTYSON, Jack W. XXII, 1078

PEDEN, Guy Theron, Jr. XXII, 1045

PERHAM, James Edwin. XXII, 982

PERLES, Benjamin Max. XXII, 1035

PERRY, Richard Lee. XXII, 1219

PESETSKY, Fred John. XXII, 1259

PETERSON, Malcolm Lee. XXII, 1229

PHILLIPS, Ray Cook. XXII, 1072

PICOZZI, Raymond Louis. XXII, 1060

PIERRE, Leon Lamont. XXII, 983

PILIAVIN, Irving Morris. XXII, 1297

PIVEN, Herman. XXII, 1298

PLASBERG, Elaine. XXII, 1162

PLOTNICK, Harold Leslie. XXII, 1259

PLUMB, William Henry. XXII, 1005

PLYLER, Lorenzo Pierce. XXII, 1278

POLAND, Harold Vincent. XXII, 1260

POLLACK, Solomon Robert. XXII, 1224

POPOVICH, Peter. XXII, 989

PORTER, Harold Troxel. XXII, 1239

PRICE, Elton. XXII, 1028

PUTTEN, James Dyke van
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PYNE, Charles Herbert. XXII, 951

PYZIUR, Eugene. XXII, 1233

RAMOND, Charles Knight, II. XXII, 1266

RANDALL, Francis Ballard. XXII, 1146

RAPSON, Ira John, Jr. XXII, 1191

RATHBUN, Arthur Samuel, Jr. XXII, 1116

RAVID, Zvulun. XXII, 1185

RAWLINS, Stephen Last. XXII, 1218

RAY, John James. XXII, 1099

RAY, Thomas Shelby. XXII, 1260

REEL, Windle Delmar. XXII, 1286

REISMAN, Marvin Norman. XXII, 1261

REYNOLDS, Esther Rebekah. XXII, 1088

RICCIARDELLI, Alex Frank. XXII, 970

RICHARDS, John Russell. XXII, 1029

RITTMANIC, Paul Anthony. XXII, 1266

RIZACK, Martin Arthur. XXII, 998

ROA, Pedro Dante. XXII, 976

ROBERTS, Spencer Eugene. XXII, 1186

ROBINSON, John Price. XXII, 977

ROSE, Lynn Edmondson. XXII, 1214

ROSEN, Nathan. XXII, 1186

ROSENTHAL, Paul Lester. XXII, 1200

ROSNER, Gabriella Edith. XXII, 1236

ROSS, Stephen David. XXII, 1214

ROWLAND, Thomas David. XXII, 1088

RUBIN, Robert Jay. XXII, 1208

RUBINFELD, Joseph. XXII, 1019

RUDD, Dale Frederick. XXII, 1107

RUDNER, Rivka. XXII, 983

RYAN, Roger Baker. XXII, 1308

SAENZ, Michael. XXII, 1035

SAID, Abdel Salam. XXII, 1030

SAIFER, Abraham. XXII, 998

SANDERS, Marlin Crosby. XXII, 1093

SANDVIK, Erik Iver. XXII, 1030

SANGALANG, Luz E. XXII, 1093

SCHACHER, John Fredrick. XXII, 1131

SCHER, Bernhard. XXII, 1299

SCHETTLER, Robert George. XXII, 1166

SCHRIER, Eugene E. XXII, 1031

SCHULTE, Bill Henry. XXII, 1073

SCHUSTERMAN, Ronald Jay. XXII, 1267

SEE, Jacob Harrel. XXII, 1074

SHAPIRO, Jerome Lee. XXII, 1120

SHAW, Horace John. XXII, 1301

SHAYEGANI, Mehdi Gholamalizadeh. XXII, 977

SHELTON, William George. XXII, 1147

SHIELDS, Robert Alexander McMillan. XXII, 1147

SHIRLEY, Frances Ann. XXII, 1187

SHOOMAN, Martin Lawrence. XXII, 1115

SHUCKER, Sidney. XXII, 1115

SHULL, Carl N. XXII, 1205

SHULTZ, Meyer. XXII, 1243

SINGER, Dorothy Milgram. XXII, 1286

SINGER, Samuel. XXII, 984

SJOGREN, Douglas D. XXII, 1089
SKIEST, Eugene Norman. XXII, 1021
SKILTON, John Hamilton. XXII, 1187
SMITH, Frank Henry. XXII, 1075
SMITH, Issar Burtan. XXII, 1230
SMITHERS, Elizabeth Joan. XXII, 1188
SMOLENSKY, Eugene. XXII, 1052
SNYDER, Eleanor M. XXII, 1036
SNYDER, William Henry, II. XXII, 1020
SONNTAG, Richard Edwin. XXII, 1117
SPAIN, Rufus Buin. XXII, 1148
SPANGLER, John David. XXII, 1279
SPECTOR, Robert Melvyn. XXII, 1149
SPENCE, Betty Lentz. XXII, 1090
SPENCER, Jordan L. XXII, 1107
SPILLER, Bertram. XXII, 1291
SPIRO, Arthur Gerald. XXII, 1206
SPRAGUE, Richard Stanton. XXII, 1188
SRBICH, Alexander Leka. XXII, 1045
STAHLY, Harold LeRoy. XXII, 1090
STANLEY, Hugh Palmerlee. XXII, 965
STANSIFER, Charles Lee. XXII, 1149
STEELE, William Frank. XXII, 1200
STEINBERG, Leon. XXII, 1201
STERNHEIM, Morton Maynard. XXII, 1218
STEVENS, Carl Alden. XXII, 1224
STEVENSON, Irone Edmund, Jr. XXII, 999
STEWARD, Robert Franklin. XXII, 1202
STILLMAN, Samuel Damie. XXII, 1122
STOCK, Marie Louise. XXII, 1189
STOLOFF, Norman Stanley. XXII, 1120
STRONG, Jerome Culton. XXII, 1037
SUBAIMA, Guthikonda Venkata. XXII, 1061
SULD, Helga Moeksi. XXII, 1000
SWANHART, Harry Gerald. XXII, 1280
SWANK, Theron Edwin. XXII, 1287
SWEENEY, James Gerard. XXII, 1162
SWIDLER, Leonard Joseph. XXII, 1150
SZOLLOSI, Daniel Gabriel. XXII, 1309
SZPAK, Stanislaw John. XXII, 1108
SZYLIOWICZ, Joseph Simon. XXII, 1233
TAMBOLI, Prabhakar Mahadeo. XXII, 952
TANDLER, Bernard. XXII, 966
TANENBAUM, David E. XXII, 1239
TANG, Jordan Jien-Nan. XXII, 1000
TARAS, Anthony F. XXII, 1189
TATE, Jack Franklin. XXII, 1005
TAYSOM, Elvin David. XXII, 955
TEXLEY, Lloyd Clair. XXII, 1075
THADDEUS, Patrick. XXII, 1218
THALER, Warren Alan. XXII, 1020
THELEN, Leverne John. XXII, 1100
THOMAS, Powell Stackhouse. XXII, 1163
THOMPSON, Larry W. XXII, 1244
THYGESON, John Robert, Jr. XXII, 1108
TIEDEMANN, John George. XXII, 1288
TISDALE, John R. XXII, 1244
TOSCANI, Bernard Michael. XXII, 1190
TRACY, Norbert John, S.J. XXII, 1076
TRIVISONNO, Joseph, Jr. XXII, 1225
TROUTNER, Ernest John. XXII, 1295
VAN PUTTEN, James Dyke, Jr. XXII, 1222
VESEY, Wesley James. XXII, 1280
VIKNER, Carl Filip. XXII, 1062
VINSON, Jack Roger. XXII, 1118
VITTIMBERGA, Jacqueline Someroski. XXII, 1020
WALKENSTEIN, Sidney Sylvan. XXII, 1001
WALKER, Charles R. XXII, 1063
WALLACE, David Harold. XXII, 1123
WALLACE, Samuel Eugene. XXII, 1292
WALTERS, Louis Lloyd. XXII, 1063
WANG, Kenneth Kwang-Hwa. XXII, 1119
WANG, Kuo Chang. XXII, 1102
WARD, John Clayton, II. XXII, 1121
WARD, Laird Gordon Lindsay. XXII, 1006
WARD, William. XXII, 1293
WASHINGTON, Joseph Reed, Jr. XXII, 1281
WATANABE, Morimichi. XXII, 1234
WEEKS, Lewis Ernest, Jr. XXII, 1164
WELCH, John Mershon. XXII, 1079
WERSHOW, Harold J. XXII, 1296
WEST, James King. XXII, 1282
WESTERVELT, Franklin Herbert. XXII, 1117
WHITWORTH, Joseph Wayne. XXII, 964
WIECK, David Thoreau. XXII, 1215
WILKINS, George Wesley, Jr. XXII, 1169
WILLIAMS, Grier Moffatt. XXII, 1206
WILLIAMS, Henry Adolphus, Jr. XXII, 1077
WILLIAMS, Max W. XXII, 961
WILSON, Charles Earnest, Jr. XXII, 1282
WILSON, George Thomas. XXII, 1064
WINCHESTER, Otis William. XXII, 1302
WINES, Roger Andrew. XXII, 1151
WINGATE, Catharine Louise. XXII, 1218
WIRTZ, John Harold. XXII, 1310
WITHERSPOON, Robert Paul. XXII, 1091
WOLF, Donald Alan. XXII, 1164
WOLFE, Donald McCreery. XXII, 1289
YA'COUB, Kamal Yousef. XXII, 1202
YANNONI, Nicholas Francis. XXII, 1032
YODER, Paul Marvin. XXII, 1207
YONEMURA, Gary Toshi. XXII, 1267
YONKER, Nicholas Junior. XXII, 1245
YOUNIS, Adele Linda. XXII, 1151